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ssed Air Magazine

DRILL DOCTOR AT WORK IN TUNNEL

Mechanic's shop hugs wall of Gateway bore in Utah

PHOTO, J. RICHARD HINCHCLIFF

VOLUME 59 • NUMBER 3

NEW YORK • LONDON

COPPUS "BLUE RIBBON" VENTILATORS

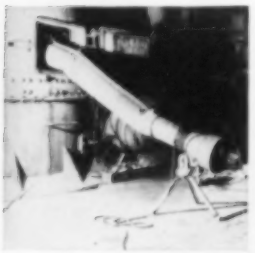
identified by the blue band

FOR WORKERS'

- *Safety*
- *Health*
- *Comfort*
- *Efficiency*

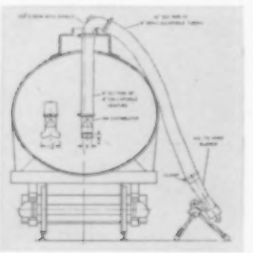
VANO® Design "A" VENTILATOR

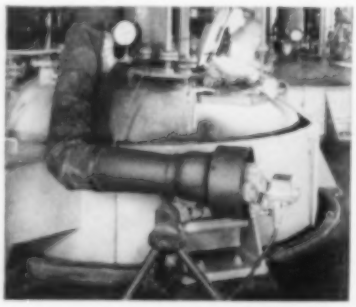
Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.



Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

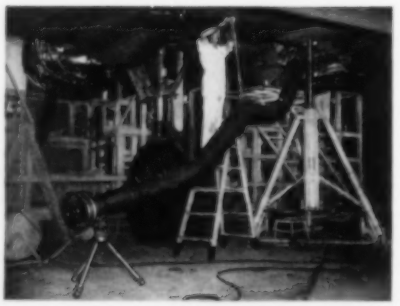
Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.





Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.

Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.



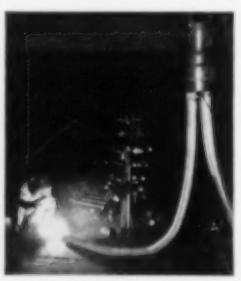
Powered by a ½hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Uses 8"-diameter flexible canvas tubing ("Ventube").

VANO
DESIGN "C"

VENTILATOR-EXHAUSTER

Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.



For withdrawing welding fumes from confined places or directly from the welding rod ...or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ...or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a ½ hp motor, it weighs only 85 lbs.

COPPUS ENGINEERING CORP., 203 PARK AVENUE, WORCESTER 2, MASS.
Please send information on the Blowers that clear the air for Action.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME.....

COMPANY.....

ADDRESS.....

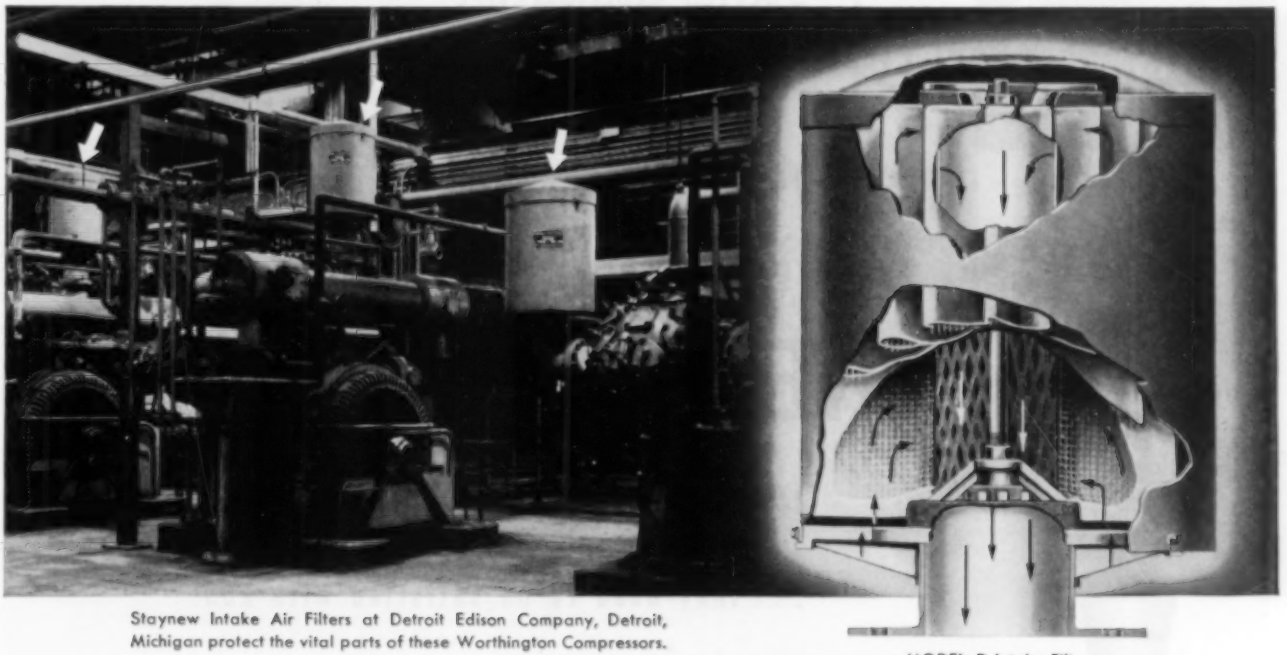
CITY.....

(Write here any special ventilating problem you may have.)

COPPUS "BLUE RIBBON" PRODUCTS—*Designed for Your Industry, Engineered for You*

Circle 1A on reply card

STAYNEW INTAKE FILTERS



Staynew Intake Air Filters at Detroit Edison Company, Detroit, Michigan protect the vital parts of these Worthington Compressors.

MODEL D Intake Filter

KEEP COMPRESSORS YOUNG!

Your air compressing equipment demands the protection Staynew Intake Filters are designed to give. With Staynew, compressors, and internal combustion engines, blowers, motors and generators remain at peak efficiency years longer.

Staynew's "Positive Protection" keeps shutdowns and repairs at an absolute minimum. And Staynew itself requires less attention. The *dry-type* filtering medium has the ability to remove air-borne dust particles without the necessity of viscous filter aids.

Staynew Intake Filters efficiently protect vital engine parts without carefully held maintenance schedules. And where noise is a problem, Model DS Silencer Filters are available. To keep equipment young, always specify Staynew.

Write today for Staynew Catalog S.I.F.

- Positive Protection
- Efficiency Actually Increases with Use
- Efficient Over a Wide Range of Loads
- Not Affected by Temperature Changes
- No Oil Carry-Over
- No Oil Blow-Out Over Free Air-Unloading Compressors

Representatives in Principal Cities

DOLLINGER PROTECTOMOTOR REG. U.S. PAT. OFF. STAYNEW FILTERS

DOLLINGER CORPORATION

7 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

now better than ever

- BETTER CARBIDE
- BETTER STEEL
- BETTER PERFORMANCE

for example

A Large Eastern Mine Now Gets

OVER 500 ft. PER BIT

with their new Carsets

. . . they used to be satisfied with 250!

When this Company started using Carset Jackbits, 250 feet of hole per bit was quite an impressive record.

Today, they expect over 500 feet per bit.

Better footage means a *better bit*. And this increase – *double* the earlier records – reflects the important improvements that have been made in Ingersoll-Rand Carset Jackbits. Improvements that make them the hardest, toughest, longest lasting bits obtainable.

Now you can get I-R Carset bits in 14 gauge sizes, from *1¼* to *3½* inches. And you can use them *on your own rods.*

Order a trial lot today, or ask your I-R representative to arrange for a demonstration. The results will speak for themselves.

A SIZE TO FIT EVERY NEED

try them on **YOUR OWN** thread connection

SERIES 100 RODS

SERIES 116 & 119 (H & D) RODS

TYPE 0, 1, 2 & 3 RODS

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

957-15

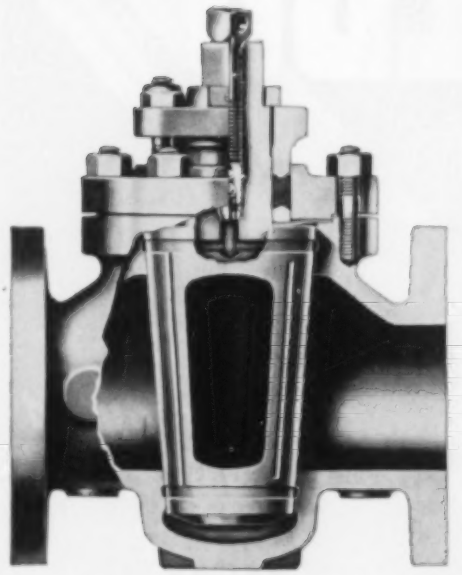
ROCK DRILLS • AIR TOOLS • DIESEL AND GAS ENGINES
COMPRESSORS • CENTRIFUGAL PUMPS • VACUUM EQUIPMENT

Circle 3A on reply card

WALWORTH

Lubricated

Plug Valves



for TOUGH *assignments*

where tight shut-off...
and easy operation
are "MUSTS"

Walworth Lubricated Plug Valves Offer These Advantages

- Complete surrounding of ports with resistant lubricant affords positive seal against leakage.
- Lubricant grooving system assures ease of operation — tight shut-off — greater protection against corrosion.
- Body and plug fully protected by lubricant from attack by line fluids.
- Quarter turn opens or closes valve.
- Made in a complete range of sizes ½" to 26" and for pressures from 175 to 5,000 psi., and for vacuum requirements.

For handling petroleum products, natural or manufactured gas, acids, alkalies, solvents, slimes, slurries . . . in fact for almost any hard-to-handle liquids—there's a Walworth Lubricated Plug Valve designed for the job.

Easy to operate, tight sealing, resistant to wear and corrosion, Walworth Lubricated Plug Valves assure long years of dependable service at low operating cost.

Walworth Lubricated Plug Valves are available in sizes ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements. For full details—prices, sizes, dimensions, and other pertinent data, see your Walworth distributor or write to:

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

NEW TOLEDO

HEAVY DUTY PIPE WRENCH

Unconditionally Guaranteed

Just introduced and making friends FAST!

New Toledo Wrenches speed the work with easy handling . . . instant non-slip grip on pipe . . . replaceable jaws with spin-easy nut and single spring for quicker easier setting . . . improved handle design for increased strength, better handgrip. 6″ to 48″ sizes.

Unconditionally Guaranteed—if wrench housing or hook ever breaks or distorts, we will replace it Free.

Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Here's what mechanics say—

GEORGIA—"Our pipe wrench replacements for 1954 are being made with the new Toledo Wrench."

MASSACHUSETTS—"Stood up very well under test. Will order Toledo Wrenches for next job."

CALIFORNIA—"Averaged five hours a day using the Toledo wrench. Likes it because jaws last much longer; quick automatic release when taking wrench off pipe; spring holds up better; does not slip on pipe."

NEW JERSEY—"Your Heavy Duty Pipe Wrench is one of the best. You can count on my future use of your products."

GEORGIA—"Toledo is one of the best pipe wrenches we ever used. They really grip the pipe and never slip."

PENNSYLVANIA—"This wrench was given to one of our mechanics who is extremely hard on tools. After two months of use and abuse, our mechanic says the Toledo wrench is as good as the day we gave it to him. We are convinced the Toledo wrench is as good as the other tools made by your company and we will buy Toledo wrenches from now on."

TEXAS—"The Toledo wrench has proven itself to be one of the finest wrenches on the market today. It was used extensively on different operations and had no faults."

Sold ONLY through distributors

TOLEDO PIPE TOOLS . . . POWER DRIVES . . . POWER PIPE MACHINES

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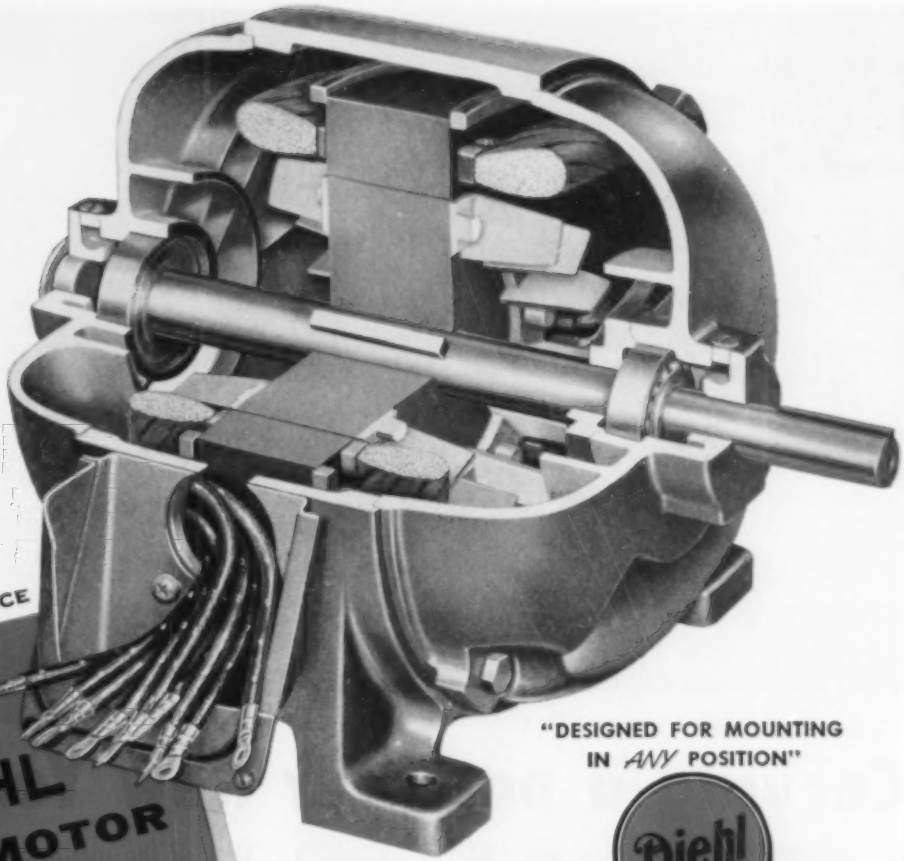


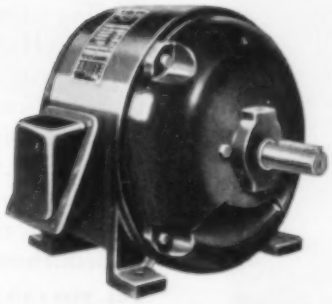
TOPS IN QUALITY
COMPETITIVE IN PRICE

SPECIFY THE
New DIEHL
TYPE "D" MOTOR

"DESIGNED FOR MOUNTING IN *ANY* POSITION"

Diehl

...here's 12 reasons why



- Most Advanced Slot Insulation
- Machine Fitted Stator
- Rotor Keyed to Shaft
- New High Dielectric Insulated Stator Windings
- Permanently Numbered Leads
- Conduit Box, An Electrician's Delight
- Centrifugally Cast, High Density Rotor Windings
- Rugged Stress-Relieved End-Covers
- New Pre-lubricated Heavy Duty Ball Bearings
- Locked-in Ball Bearing
- Dual Ventilation System
- Extra Strong Cast Iron Frame

Designed and engineered for more efficient performance. Smaller in size, lighter in weight and quieter in operation.

Consult our engineers before writing your specifications and get the benefit of 68 years of experience in the design and manufacture of general and special purpose motors

Diehl motors will still be available in old NEMA Standard frame sizes for interchange and replacement.

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins

☐ New Type "D" Motor Bulletin No. CA 3304
☐ Consolidated Catalog & Price List No. CA 3310

Name_____
Company_____
Street_____
City_____ State_____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

Circle 6A on reply card

No place for a motorist—yet. This photograph shows the difficulties encountered in building a road through Catskill Mountains region.

Carving a path for New York Thruway

Wagon drills make the dust fly as Bethlehem hollow drill steel bites into the limestone. This steel provides economical drilling, time after time.

One of the major problems involved in constructing a 22-mile section of the New York Thruway in the Catskill Mountains, between Ravena and Palenville, N. Y., was the removal of approximately 2,000,000 cu yd of medium-hard limestone.

The contractor for the rough grading, as well as for the paving which followed, was The Savin Construction Corp., East Hartford, Conn. In the rock-removal operations, the Savin organization used wagon drills equipped with Bethlehem hollow drill steel, 1¼ in. round, fitted with carbide-insert bits. The approximate footage drilled was 1,500,000 lineal feet, with some of the blast holes going as deep as 30 ft. The project manager, B. A. Wilder, reported satisfactory results in every way with Bethlehem Hollow.

Yes, you can always count on good performance with Bethlehem Hollow, even under the toughest drilling conditions. Bethlehem Hollow has a wide quenching range, making it easy to heat-treat for the ideal balance of hardness and wear-resistance. It makes long-wearing threads, and tough shanks. It's well able to take the fast, hard blows of modern rock drills.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Two Grades of

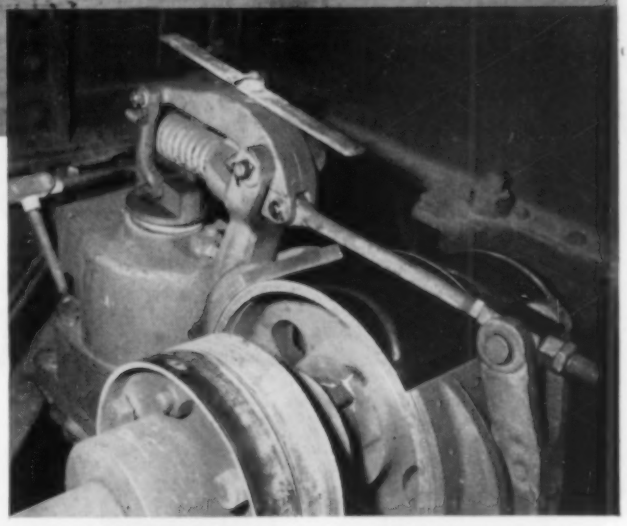
BETHLEHEM HOLLOW DRILL STEEL

CARBON · ULTRA-ALLOY (chrome-moly)

BETHLEHEM STEEL

Circle 7A on reply card

DULUTH-SUPERIOR BRIDGE opens from 15 to 30 times daily in the iron ore shipping season to let ore boats through. Wiring for lighting, protected by 1500 feet of Everdur Electrical Conduit, is installed under the deck.



HERE EVERDUR CONDUIT protects wiring to electric brakes on bridge motor. It is also used for power lines to emergency generator, and on lines serving strip heaters in power house.

Everdur passes long test on Duluth-Superior span

One job Everdur* Electrical Conduit does on the Duluth-Superior Bridge is protect electric light lines. Heavy rain and snow driven by 60 to 70 mile-an-hour winds often pound at this conduit. Heat and cold do their worst. It is exposed to acid fumes from ore boats and rail traffic. Vibration from opening and closing of the bridge, and constant traffic, is a daily threat. Yet recent inspection shows the Everdur Rigid Conduit still in excellent condition. Not a sign of wear, rust or corrosion!

Everdur Electrical Conduit is made of Everdur Copper-Silicon Alloy in two wall thicknesses (R.C. and E.M.T.). For additional information about this Anaconda Product, write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

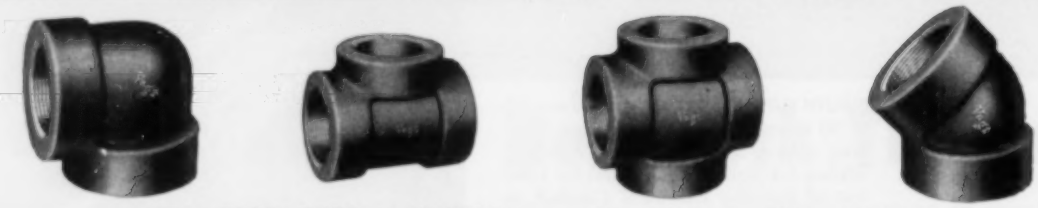
*Reg. U. S. Pat. Off. 53150A

***wherever corrosion resistance counts*—EVERDUR ELECTRICAL CONDUIT**

an ANACONDA® product

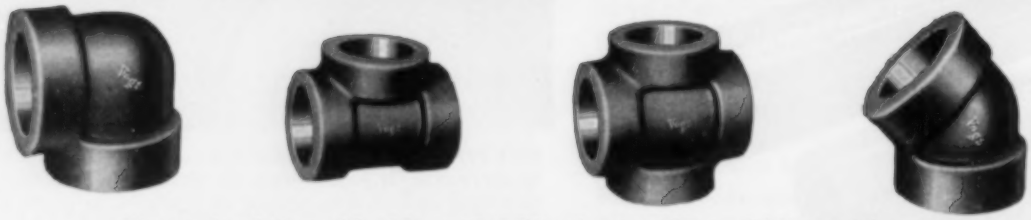
STRENGTH

for Safety and Long-Time Service



For 2000, 3000 and 6000 pounds service — Sizes 1/8" to 6"

SCREW END TYPE



For schedules 40, 80 and 160 pipe — Sizes 1/8" to 4"

SOCKET WELD TYPE

Vogt Ells, Tees, Crosses, etc., are forged from carbon steel or various alloys to meet specific operating conditions. Catalog F-9 will aid you in their selection and proper application.

Shocks and stresses imposed by high pressures and high temperatures are taken in their stride because Vogt fittings are uniform in structure, fine grained, and free from porosity . . . the superior product of laboratory controlled materials and giant forging hammers and upsetters. These properties also give higher resistance to erosive and corrosive conditions, thereby adding to service life expectancy in steam plants, petroleum refineries, chemical plants and related industries.

HENRY VOGT MACHINE CO., INC.
Louisville 10, Kentucky
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

Vogt DROP FORGED STEEL FITTINGS

Circle 9A on reply card

GEORGE M. BREWSTER & SON, Inc.

uses GYRO-FLO 600's

to help move 900,000 yards of rock

These four 600 cfm Gyro-Flo portables supply air power for operating up to eleven I-R wagon drills on this job. Air from the receiver is piped 700 to 800 feet to the drilling site through a 6" line. In left foreground is an I-R air powered Jackbit grinder.

Big job in a hurry. That's the fabulous N. Y. Thruway —a non-stop, high-speed highway from New York City to Buffalo, scheduled for completion in 1954.

To George M. Brewster & Son, Inc., sub-contractor for all rock work on the 7½ mile stretch from Kingston to Whiteport, goes the job of excavating an estimated 900,000 cubic yards of rock in record time. And this project is already well under way—with the help of Gyro-Flo portable compressors and I-R rock drill equipment.

The Gyro-Flo rotary sliding-vane compressor speeds drilling operations by delivering an abundant supply of air, at constant pressure, with the most dependable, trouble-free performance ever obtainable in a portable unit. That's because the Gyro-Flo has no valves, pistons, rings, rods or clutches to wear out, adjust or replace. It delivers oil-free air at temperatures that never exceed 200° F. And pressure is controlled closely and smoothly all the way from 0 to 100% capacity.

Now available in 125, 210, 315 and 600 cfm sizes, Gyro-Flo portables offer a new high in air power efficiency for practically any job. For the complete story, contact your nearest Ingersoll-Rand distributor or branch office.

2-28

Above are four of the FM-2 wagon drills supplied by the Gyro-Flo compressors shown at the top. Each drill is equipped with an I-R air hoist to facilitate movement of the drill carriage on the steep slopes.

Brewster also uses three self-contained, self-powered and self-propelled I-R Quarry-masters for deep-hole drilling.

Ingersoll-Rand

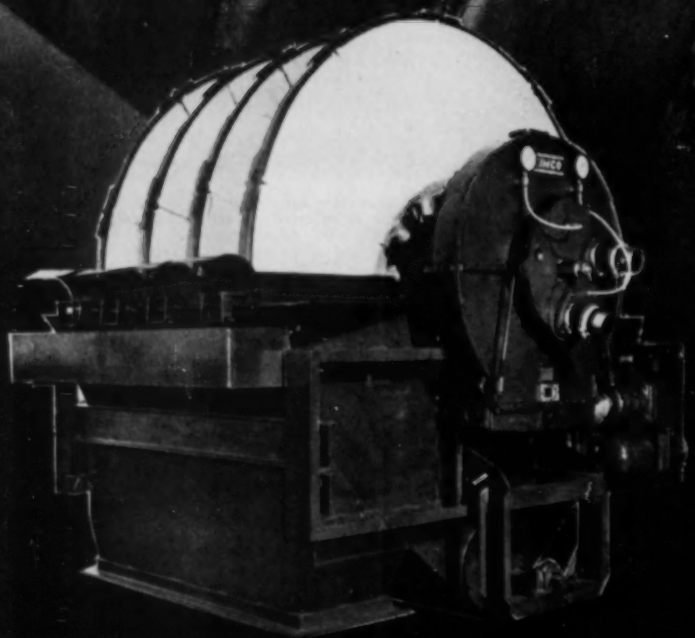
11 Broadway, New York 4, N. Y.

CONTRACTORS' COMBINATION

COMPRESSORS
ROCK DRILLS
AIR TOOLS
TURBO BLOWERS
CONDENSERS
CENTRIFUGAL PUMPS
DIESEL AND GAS ENGINES

INCREASE PRODUCTION and LOWER MOISTURE CONTENT

in dewatering metallurgical slurries with fast settling solids



An EIMCO Agidisc Filter
8' Diameter x 4 Disc Unit

Two critical factors in dewatering of metallurgical slurries with fast settling particles are improved by using Eimco Agidisc Filters.

These dependable filter units have been used on many different materials with remarkable success. In the dewatering of a copper concentrate an Eimco Agidisc was installed beside a filter of standard disc design. The Agidisc produced from 20-25% more tonnage and the discharged cake contained 1½-2% less moisture.

In the same plant a metallurgical drum type filter was running on the same feed. The moisture on the Agidisc was ½ of 1% lower than on the drum filter.

Other installations are showing equally as good or better results.

Let an Eimco engineer tell you about the Agidisc. Write for a bulletin on the Agidisc to The Eimco Corporation, Box 300, Salt Lake City, Utah.

B-21

THE EIMCO CORPORATION

Export Offices: Eimco Bldg., 52 South St., New York City • Salt Lake City, Utah—U.S.A.

You Can't Beat An Eimco

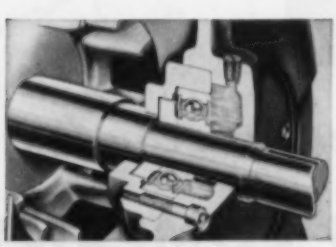
FOR COMPRESSOR SERVICE...

"All motors are NOT alike!"

RELIANCE *Precision-Built* **MOTORS**

Reliance Splashproof Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from ¼ to 300 hp. Get the full story—ask for Bulletin B-2101.

- ☆ Low starting currents... high starting torque ...liberal ratings
- ☆ Smooth acceleration ... quiet operation
- ☆ Tough, vibration-proof Reli-X insulation



... AND THE BEST PRE-LUBRICATED BEARING DESIGN

The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1458C

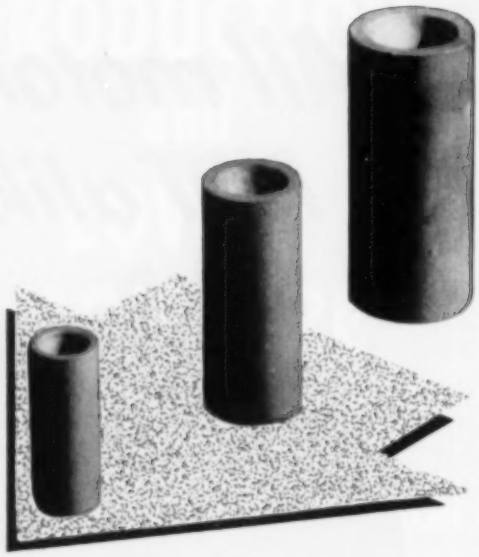
RELIANCE ELECTRIC AND ENGINEERING CO.

1118 Ivanhoe Road, Cleveland 10, Ohio • *Sales Representatives in Principal Cities*

Circle 11A on reply card
Circle 12A on reply card

Leading Foundries Use...

NORBIDE® Nozzles



Because . . .

- They get more service per dollar cost (750 hours silica sand — 1500 hours steel shot or grit). NORTON guarantees this minimum service.
- Their air consumption is reduced from 10 to 20 per cent as compared with iron nozzles.
- They maintain stream contour and abrasive velocity.

For full details on cost-cutting NORBIDE Nozzles, write for your free copy of Form 543.

NORBIDE®... *the longest nozzle life you can buy*

NORTON

BORON CARBIDE

NORTON COMPANY

41 New Bond Street • Worcester 6, Mass.

Making better products . . . to make other products better

Circle 13A on reply card

answer the call
1954 RED CROSS CAMPAIGN
JOIN and SERVE!

ON THE COVER

A TUNNEL being driven through rock is a busy place. Traffic is heavy in both directions and there's little room along the sides to get out of its way. A layman wouldn't consider it a good place to set up a shop. However, the drill doctor in the Gateway Tunnel who is shown on our cover doesn't seem to mind the obstacles. His equipment is strung out along the wall and he keeps a weather eye out for trains that rumble past almost as close to schedule as crack railroad streamliners. On an operation such as this, where some tunneling speed records have been broken, every second counts. By maintaining the shop close to the heading instead of outside the portal, as is customary, a lot of time is saved in transportation. As the drilling face advances, so does the shop.

IN THIS ISSUE

THE Mormons introduced irrigation along the eastern shore of Great Salt Lake more than a century ago. Now the Bureau of Reclamation is launching the multimillion dollar Weber Basin Project in the same section. Page 62.

•

BLAST holes in roughly three-quarters of the length of the 10-mile tunnel of the Alcan Project (page 68) were drilled with Carset (detachable tungsten-carbide insert) bits. As purchased, they were 2 inches in diameter and, on an average, accounted for 240 feet of hole before being discarded. Meanwhile, as a result of wear and several resharpenings, the diameter had been reduced to around 1⅝ inches. However, even the smallest bits drilled holes with ample room for the 1¼-inch cartridges of explosives that were used.

Conventional steel bits, however, would have been dulled to the point of needing resharpening after only 2 feet of drilling. Consequently, holes drilled to the maximum depth of 16 feet would have required eight bit changes, as compared with no changes for the Carsets. Obviously, the latter saved much time. Moreover, each steel bit in the series of eight would have been a trifle smaller than the preceding one because of wear and resharpening. To allow for this step reduction and still bottom the holes big enough readily to receive the 1¼-inch cartridges, it would have been necessary to start them well above the 2-inch size that prevailed in the case of the Carsets. It has been pointed out that starter bits might have had to be as large as 2⅝-inch gauge. Inasmuch as an increase in the size of a hole slows drilling speed appreciably, a further advantage is gained in using the tungsten-carbide bits.

•

EVEN if you weren't told, you would surmise from the name that A. Schrader's Son is an old firm. Actually, it goes back to 1844, and throughout much of its existence it has been concerned with devices that either use or control compressed air. One of them, the Schrader tire valve, is known the world over. Page 72.

Compressed Air Magazine

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VOLUME 59 **March, 1954** NUMBER 3

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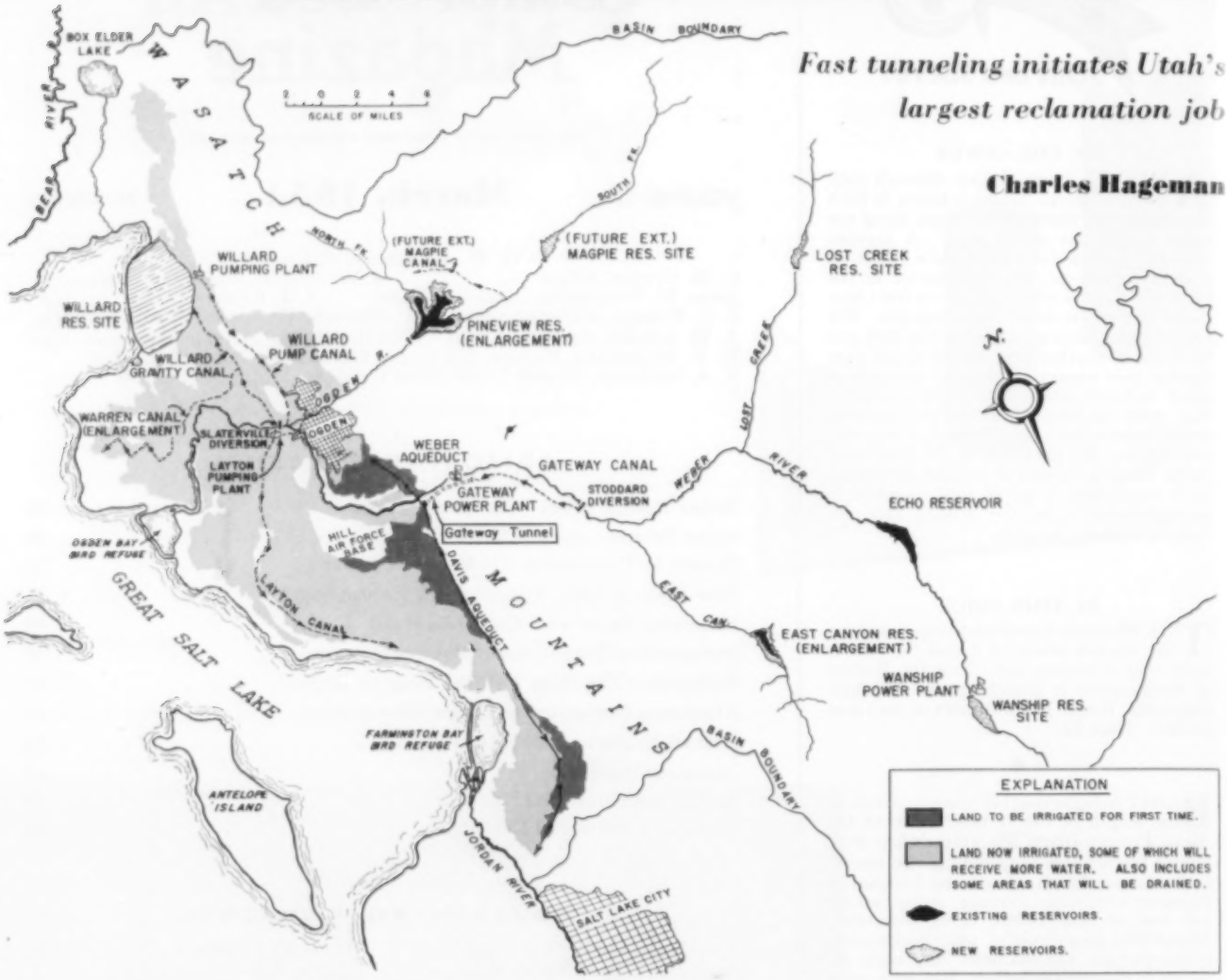
WEBER BASIN PROJECT



Fast tunneling initiates Utah's largest reclamation job

Charles Hageman

THE PROJECT AT A GLANCE

By enlarging existing Pineview and East Canyon reservoirs and building two others—Wanship and Lost Creek—much of the water that now wastes into Great Salt Lake will be stored for release during the summer and fall irrigating season. The Gateway canal and tunnel will deliver some of this water to the west side of the Wasatch Mountains at a high enough level to permit watering—through the Davis and Weber aqueducts—27,000 acres of land that is not now being irrigated. Water not captured upstream and that released during the winter months for power generation will be diverted just below Ogden to the Willard Gravity Canal and flow into the Willard Reservoir for storage. During the irrigating season it will be lifted from the reservoir into the Willard Pump Canal and returned to the river system and diverted thence to canals for distribution to the lower farmlands. Power developed at Wanship and Gateway hydro plants will operate the pumps. Additional water will be provided by drilling approximately 80 wells in the area adjoining the lake. By lowering the ground water level they will prevent irrigable lands from becoming waterlogged. With the same object in view, 202 miles of drainage canals will be excavated in this area. Some of the water thus collected will be used for irrigation elsewhere and the surplus will be delivered to the Ogden and Farmington bays refuges for migratory waterfowl.

UNUSUALLY rapid progress is being made by the Utah Construction Company in driving the Gateway Tunnel through a portion of the Wasatch Range near Ogden, Utah. The 3.3-mile bore, a key structure in the U. S. Bureau of Reclamation's Weber Basin Project, will carry up to 435 cubic feet of water per second for irrigating farmlands and serving industrial and domestic needs in an area bordering the east shore of Great Salt Lake and extending from Ogden some 30 miles south toward Salt Lake City.

Crack crews directed by H. C. (Duke) Miller, project manager, advanced the heading 76 feet last December 3 and 75 feet on the following day. Both performances bettered the 74-foot mark that had been established by John R. (Long John) Austin's men in the Carlton Tunnel at Cripple Creek, Colo., in 1940 and been generally accepted as the record for a small bore in hard or medium-hard rock. The fastest day's progress ever reported was 104 feet and was made in the soft rock of the Owens Gorge Tunnel in California in 1949 by forces under George W. Foster.

The Gateway drillers drove 379 feet in the 6-day week ended December 5, 1953. This is at the rate of 442 feet in seven days, as compared with 488 feet registered in the Carlton Tunnel in a like period. In the month ended December 31, 1953, the Gateway heading was advanced 1350 feet. Actual working time was only 24½ days. Projected at the same rate, the total for 31 days would have been 1720 feet, as against 1879 feet achieved in the Carlton bore in 31 consecutive days.

For the total of 14,274 feet driven up to February 1, the average footage per working day at Gateway has been a little more than 49, and it is hoped to bring this up to 50 feet by the time the job is completed. This average com-

pares with one of 48½ feet maintained by the Carlton crews during the full 6 miles of tunneling. The first 5 miles was driven at a rate of 51.46 feet per day.

From the foregoing figures, it is apparent that the results at Gateway rank among the best ever achieved. They are especially noteworthy when it is considered that steel supports had to be erected in practically all stretches and that the top daily advance was made under those conditions. In fact, it exceeded by a comfortable margin the best mark of 71 feet reached in an unsupported section on July 15, 1953.

Designed mainly to store and distribute surplus water from the Weber River system that is now going to waste, the Weber Basin Project is expected to alleviate shortages along the Wasatch front that have been growing more and more serious. Incidental benefits to be derived from this phase of the scheme will be the end of flood damage along the Weber and Ogden rivers, abatement of stream pollution, generation of a small amount of hydroelectric power and the creation of extensive recreational facilities. In low-lying areas near the lake will be sunk wells to provide additional water, and, paradoxically, some waterlogged land will be drained. The water from drains not needed for irrigation will be fed to two existing refuges for migratory waterfowl to improve conditions there.

The present reclamation project is the largest undertaken to date in Utah, and its estimated cost of $70,385,000 exceeds the combined expenditure for the nine projects previously carried out in the state. Of this sum, $57,694,000 is expected to be repaid to the Federal Government by beneficiaries of the scheme. Their number and variety is indicated by the fact that more than 50 separate agreements with municipalities and irrigation companies—and several hundred more with industrial water users—were required to include all of them.

SUMMARY OF RESERVOIR DATA

Name of Reservoir	Location	Status	Capacity	
			Present	Ultimate
			Acre-feet	
Mountain Valley Area				
Wanship	Weber River	Proposed	0	60,000
Echo*	Weber River	Existing	74,000	74,000
Lost Creek	Lost Creek	Proposed	0	15,000
East Canyon	East Canyon Creek	Proposed enlargement	28,000	45,000
Pineview	Ogden River	Proposed enlargement	44,200	110,000
East Shore Area				
Willard	Near Great Salt Lake	Proposed	0	215,000
			146,200	519,000

*Echo Reservoir will not be enlarged, but its operation will be correlated with that of other project reservoirs

The Weber Basin Project was authorized on August 29, 1949, when President Truman signed a bill passed by the Congress. Its history, however, actually goes back much farther. Without resorting to storage, the early settlers were able to irrigate about 3000 acres by merely diverting the natural summer flow of the Weber River into distribution canals. As the acreage was increased, the added land received water only during part of the growing sea-

IRRIGATION AT WORK

A field of potatoes (below) near Kaysville in the Weber Basin and a peach orchard flanking a stretch of the Weber-Davis canal south of Layton. It is lined with concrete to prevent loss of water through percolation.

SUPPORTED SECTION OF TUNNEL

Out of the way, along the spring line and overhead, are the 2-inch water pipe, 6-inch compressed-air line, 22-inch ventilating duct and lighting-circuit wires. Leaning against the sides are short sections of track that are used at the heading.

son unless the runoff was above normal.

Although the Reclamation Service, predecessor of the Bureau of Reclamation, made a survey of the basin's water resources in 1904 and 1905, nothing concrete was done towards relieving the situation until 1916 when private interests built the East Canyon Reservoir with a capacity of 28,730 acre-feet on East Canyon Creek, a branch of the Weber. The possibility of constructing another storage reservoir was investigated in conjunction with the Utah State Water Storage Commission. In 1924 a site was selected on the Weber some 30 miles above Ogden, and Echo Dam was built there later. It went into service in May, 1930, and impounds 73,900 acre-feet of water. Subsequently the Pineview Reservoir of 44,200 acre-feet capacity was constructed by the Bureau of Reclamation a few miles upstream from Ogden on the Ogden River, a tributary of the Weber.

These facilities have increased the utilization of the water in the Weber River system, but about half of the annual average flow, or 350,000 acre-feet, is still not being caught and is running into Great Salt Lake. Meanwhile, agricultural development in the Weber basin has reached the saturation point. No new farms can be established unless more water becomes available, and some already operating do not have enough. Industrial expansion likewise has been curtailed, and an unpredicted growth in population has overtaxed municipal water supplies. Serious shortages have been averted only because precipitation has been above normal in recent years.

In the face of these circumstances, rural and urban residents united in an effort to obtain relief, and the Bureau of Reclamation coöperated by submitting to the Congress an interim report on which later legislation was based. Following approval of the project, the Weber Basin Water Conservancy District was organized under the state laws on June 26, 1950, and has led in promoting execution of the scheme and especially in getting work started as fast as possible. The first funds, $1,350,000 were voted by the Congress on July 9, 1952, and on October 1 of the same year the Bureau asked for bids on the construction of the Gateway Tunnel.

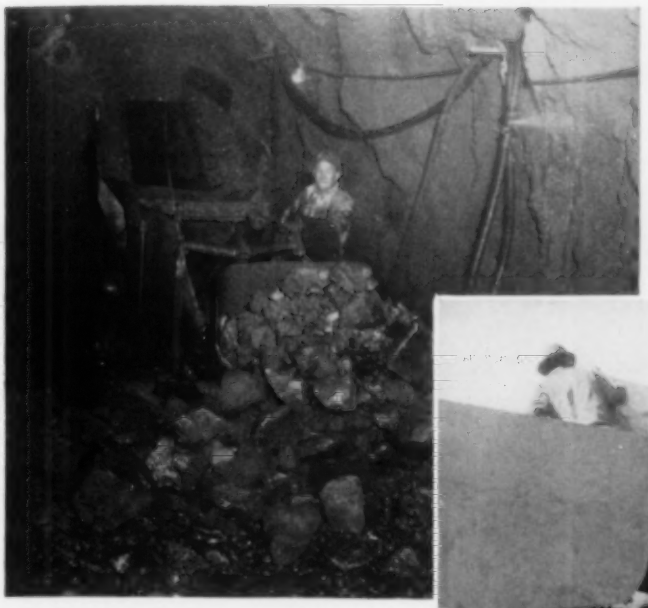
Full development of the undertaking will provide facilities for storing and distributing an annual average of 270,100 acre-feet of water. Of this total, 164,600 acre-feet will go for irrigation, 40,000 acre-feet for municipal and industrial use (in Ogden and twenty other smaller cities and towns) and 65,500 acre-feet for the bird refuges. Less than 10 percent of the water of good quality now unused will escape into Great Salt Lake when the project is completed.

The principal structural features of the scheme include the heightening of two existing dams—Pineview and East Canyon—and the building of three new dams: Wanship upstream from Echo on the Weber River, Lost Creek on the waterway of that name and 12 miles above its junction with the Weber, and Willard by diking off a portion of Great Salt Lake near the northern end of the principal area to be irrigated.

Most of the water to be released from the reservoirs formed by the Wanship, East Canyon, Lost Creek and Echo dams will flow down the Weber River to a point 4 miles west of Morgan, where the Stoddard Dam will divert it into the Gateway Canal. The latter will follow the south side of Weber Canyon for 8.5 miles and have an initial capacity of 700 cubic feet per second. At the Gateway Tunnel intake, some of the water will be turned into a penstock leading to the Gateway Power Plant below. That station will have an installed generating capacity of 4000 kw.

DRILLING THE ROUND

Although few of them are visible there are five miners, five chuck tenders, a nipper and a shift boss in this constricted space. Before muck can come out, blast holes must be put in. At the center-left is the auxiliary drill at the rear of the carriage that is used to put in holes for pins to support the pipe lines.



MOVING MUCK

An Eimco loader (left) in action as it looks from the muck pile it is working on. Outside the tunnel, the muck is dumped (below), one car at a time, by a portable hydraulic ram powered by a pump in the small building at the right.

At the toe of Wanship Dam there will also be a small hydro plant (1400 kw installed capacity). Power from these two stations will be transmitted to a point near the Willard Reservoir and used to operate pumps that will lift the water impounded in that basin 63 feet and discharge it into the Willard Pump Canal. Other project pumps will be supplied with energy from that source.

Willard Reservoir will be the storage basin for surplus water not regulated by upstream reservoirs and for water released by upstream power plants during the winter. This surplus will be diverted by the Slaterville Dam, below Ogden, into the Willard Gravity Canal, which will be 10.8 miles long and have a capacity of 1105 cubic feet per second. During the irrigation season it will be returned by way of the pump canal to the Weber River at a point just above the diversion dam, where it will join water from upstream sources and be distributed through canals to lower lying areas.

To come back to the Gateway Canal in Weber Canyon, the water that is not taken out for generating power will flow into the Gateway Tunnel. This bore will run through the south wall of Weber Canyon and generally parallel to Highway 30 South but at a higher level. By routing the water through this tunnel rather than letting it flow down the river, it will emerge on the west slope of the Wasatch Mountains at a higher elevation and can thus be distributed by gravity to 27,000 acres that could not be irrigated previously by diverting water from the stream.

Most of the land is south of the Weber, and the water will be conveyed to it by the Davis Aqueduct, a buried conduit 23 miles long with an initial capacity of 355 cubic feet per second. The Weber Aqueduct, with a capacity of 80 second-feet, will extend northward from the river for a distance of 5 miles to serve farmlands in that area. The water that flows down the Weber rather than through the Gateway Tunnel will be delivered to lands farther down by the new unlined 20.4 mile Layton Canal and various shorter channels already in existence. These facilities will supply water to 48,000 acres that are now inadequately irrigated and to new land. The Gateway Canal and tunnel and the two aqueducts will also convey municipal and industrial water to points between Ogden and Salt Lake City.

The Gateway Tunnel, of horseshoe section, is being excavated 11 feet in diameter, which will be reduced to 9 feet

LOADING THE HOLES

With long rods of nonsparking wood, the men ram home the dynamite cartridges. Those who are visible are working from the upper deck of the drill carriage.

ECHO DAM

Built nearly 25 years ago, this structure on the Weber River marked the beginning of modern irrigation in the area. It will be incorporated in the scheme now under development.

4 inches when it is lined with 10 inches of unreinforced concrete. The intake is at Elevation 4941 and the outlet is 17.16 feet lower. The entire length of 17,187 feet is being driven from the lower end, which provides gravity drainage for any water that may be encountered amounting to 600 gpm maximum flow.

The basement rocks of the section through which the tunnel line passes are of pre-Cambrian age and have undergone so many modifications that they are locally called the Farmington Canyon Complex. In Laramide times, especially, crustal upheavals caused folding, and intrusions of granite changed the original character of the adjoining rocks. As a result, the complex now consists predominantly of various metamorphic or altered rocks such as gneiss and mica schist, with feldspar, talc and quartz.

In most places shear planes and joints have formed highly irregular blocks. These lines of division range from 6 to 12 inches apart in the harder rocks and down to as little as a fraction of an inch in many softer areas. Several fault zones have been cut, some filled with finely divided "gouge" and others with brecciated material, and the adjoining rock is usually badly broken for a considerable distance. These geological conditions have made it necessary to support the arch nearly all the way. Two-piece sets of 5-inch-flange steel weighing 18.9 pounds per foot have generally been used and are spaced on 2- to 5-foot centers, depending on the formation penetrated. Some 6-inch, 20-pound sets have been placed in faulted zones. Lagging is 3 inches thick.

Drilling is done with five Ingersoll-Rand DA-35 drifters arranged for 4-foot steel changes and mounted on power booms on a carriage or jumbo that runs on rails. Three drills are stationed above the carriage deck and two below it. A sixth machine on a boom at the rear puts in holes for pins used in supporting the compressed-air and ventilating lines. The carriage travels on track of 24-inch gauge. Its hinged side aprons are lowered when it is drawn back from the heading, thus reducing its over-all width to 4 feet and enabling muck trains to clear it.

From 20 to 36 holes are drilled and blasted each round, the number and pattern varying with the nature of the ground. Ingersoll-Rand Carset (tungsten-carbide insert) bits are normally used in gauge sizes from 1¾ down to 1½ inches. Blasting is done with Atlas Gelodyn 45 percent strength dynamite in 1¼x8-inch cartridges. Primers are of 40 percent Giant Gelatin in 1⅛x8-inch sticks. Powder consumption per cubic yard ranges from 1½ pounds in soft rock in or near fault planes to 6 pounds in the hardest rock.

The depth of the round and therefore the size of the muck pile varies with the character of the formation. In soft ground, a 4-foot round will produce about 30 cubic yards of loose material, plus overbreak; in stable ground an 8-foot round will bring down around 55 cubic yards. An Eimco air-powered mucker loads the broken rock into 4-cubic-yard Granby-type dump cars manufactured by the Coeur d'Alene Hardware & Foundry Company, of Wallace, Idaho.

The haulage track is of 24-inch gauge, but as the loader has to operate on 36-inch track it is necessary to have both widths at the heading. To maintain them close enough to the face so the mucking machine can function, rails of 7½-foot length are laid. Then, when the heading has been advanced 60 to 90 feet, they are replaced by 30-foot sections of 24-inch track. Thus not more than twelve of the short lengths are re-

First U. S. Irrigation Was in This Section

THIS undertaking, which is primarily concerned with irrigation, is located almost in the cradle of American irrigation. The Mormons, who are credited with having been the first in this country to practice irrigation on a large scale, established their first settlement on the shore of Great Salt Lake, a little to the south. It is recorded that on the very afternoon in July, 1847, that the advance group reached the valley, three plows were put in the soil, potatoes were planted and the waters of City Creek were diverted to the plot.

Within a short time the 2000 pioneers had fanned out over much of the nearby slope of the Wasatch Range, and after that area had been occupied explorers were sent out in all directions in search of the most fertile land where plenty of water was conveniently available. As it was found, 30 or 40 families of the colonists who were continually arriving were assigned to settle in each place. Under this plan the Ogden Valley, site of the work being described here, was cultivated in 1848.

quired, and they are made up of 6-inch channels that serve as ties and the four rail sections, which are held in place with clips. When the substitution is made, the 7½-foot lengths are left leaning against a side wall until they are needed to extend the tracks to the face. The loader is provided with four dollies gauged to the 24-inch track. These work on eccentric arms which raise the whole mucker sufficiently when they engage the rails so that the 36-inch-gauge wheels clear them and the machine can be moved back on to the narrower track.

Conventional "California switches" are provided so that empty cars can be shunted to the heading in turn and muck trains pass one another or parked equipment such as the drill jumbo. These portable sections of double track rest on top of the regular haulage track. One is advanced daily and kept as close to the working face as possible. It is used to switch a full car away from the mucker and to bring an empty car forward, jobs that can be done in 20 to 30 seconds. Two locomotives are in service, one on each track of the switch. Loading a car and making the switch consumes 120 to 135 seconds.

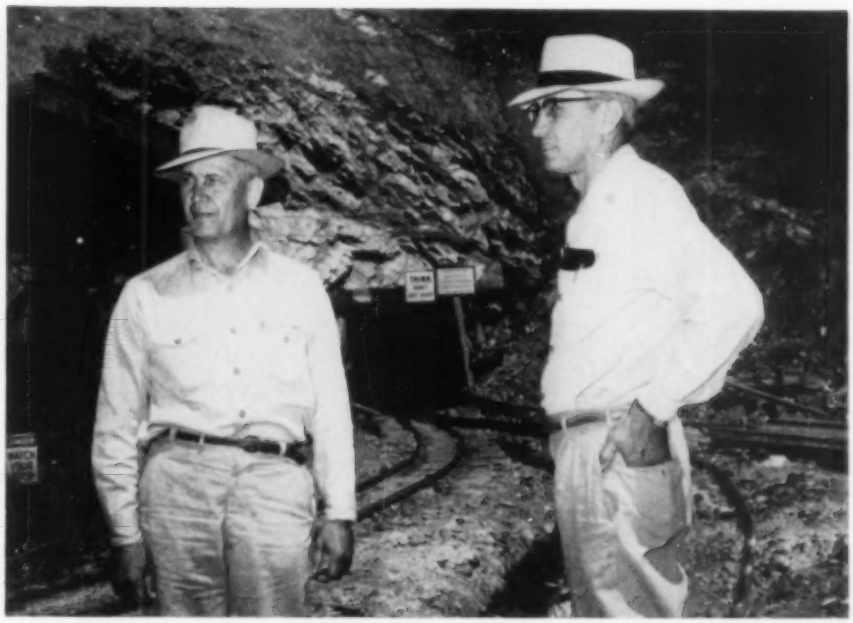
A second California switch is used to sidetrack the drill carriage or the mucking machine which, of course, are operated alternately. Cars carrying powder, steel tunnel supports, lumber and blocking also are spotted there until they are needed in the heading. A third switch has been located some 300 feet behind the second one so units other than those described can pass one another and locomotives can be shunted from one end of a train to the other. A locomotive always pulls its string of cars in or out, does not push it. This gives the motorman good vision, thus expediting operations and promoting safety. The two rearward switches are moved forward with each 1000-foot advance.

Three Greensburg 10-ton storage battery locomotives with a 60-inch wheel base and 54-cell, 29-plate batteries furnish tractive power. They, as well as the muck cars, are designed so that they can be converted from 24- to 36-inch gauge. After the tunnel has been excavated, the cars will be used to haul concrete for lining it. For this service the dump body will be lifted from each chassis and replaced by four aggregate batch hoppers. Air for operating the drills and for other purposes is supplied by two 2-stage compressors having a combined capacity of 3000 cfm, and the pressure at the heading is maintained at not less than 100 psi.

To ventilate the tunnel, fresh air is drawn in by exhausting the air from the face through a 22-inch duct in which suction is induced by a 22x60-inch blower stationed outside. At intervals of 2500 feet, beginning at a point 7500 feet in from the portal, Axivane 2-stage, 25-hp fans are tied into the system as boosters. Following each blast, a blower at the heading drives fumes and dust back to the end of the suction line. By this arrangement the air at the working face can be cleared within ten or twelve minutes after a blast.

Tunnel driving was started on January 23, 1953, and it is expected that it will be finished in April. Indications are that the bore can be lined in time to save well over a year of the three years allotted in the contract for the whole job.

Work on the Weber Basin Project is directed for the Bureau of Reclamation by Clinton D. Woods, acting area engineer, and Ross D. Billings, construction engineer. Reed Gunderson is chief inspector. In addition to Mr. Miller as project manager, Utah Construction Company is represented by Charles Hageman as project engineer and Charles J. Getz as office manager.

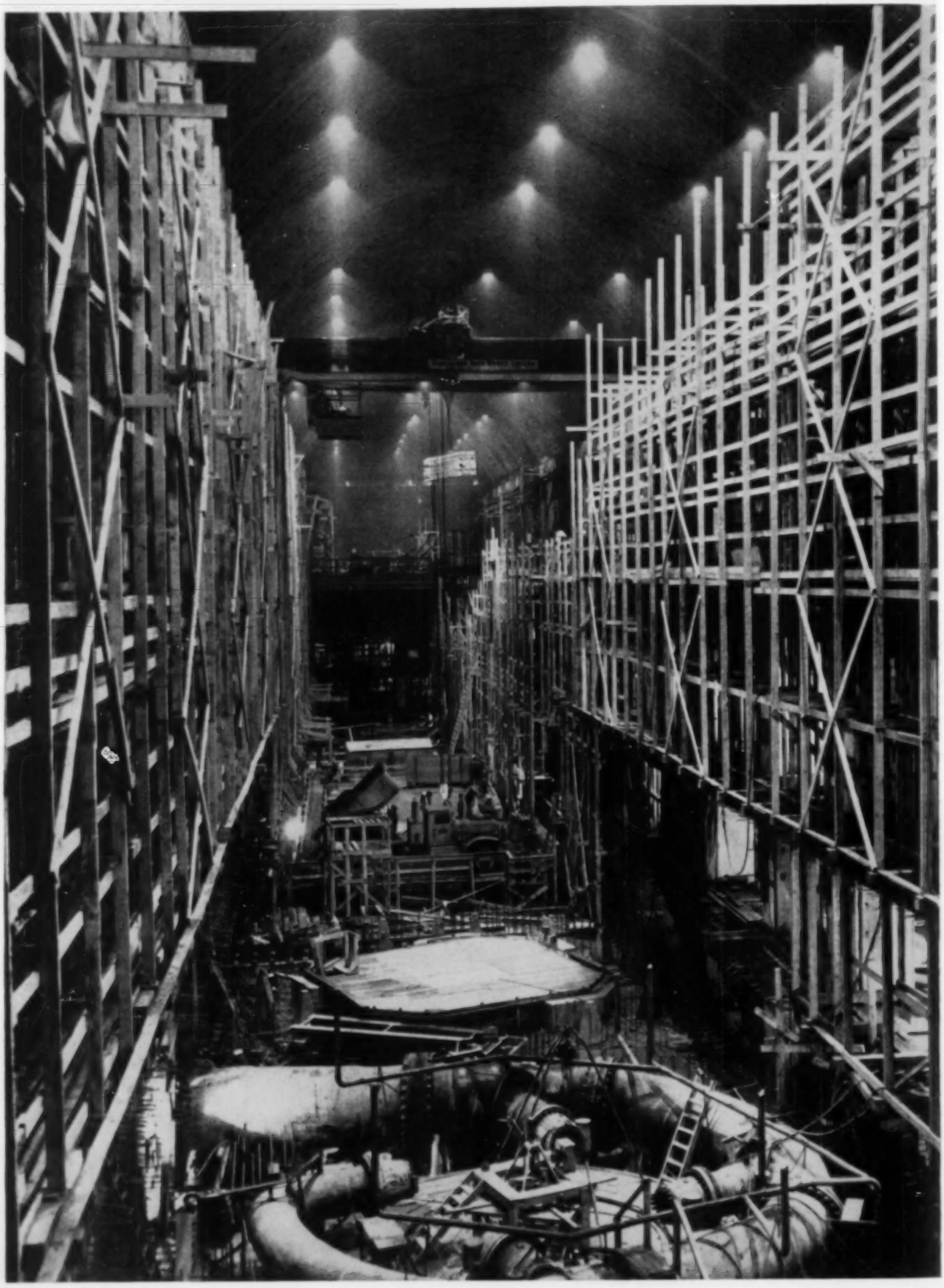


IN CHARGE

H. C. Miller (left), project manager for the Utah Construction Company which is driving the Gateway Tunnel, and Ross D. Billings, construction engineer for the Bureau of Reclamation.

TOUGH GOING

In faulted zones and a few other stretches, bad ground was encountered. In the location illustrated, it was loose rock and mud. The miner is putting in a crown bar and is sitting behind the vertical-face spiling.



COLOSSAL CAVERN

The assembling of one of the generating units is shown getting underway in the vast underground powerhouse at Kemano which encloses about the same volume of space as the Mammoth Cave in Kentucky.

ALCAN ECHOES....

Statistics show vital role rock drills play in huge Canadian project

Allen S. Park

STATISTICAL echoes are still resounding from the outstanding job of rock excavation carried out on the Alcan power and aluminum-smelter project in British Columbia by the forces of Morrison-Knudsen Company of Canada Limited. Figures are now available on the over-all performance in the 25-foot-diameter tunnel that was driven 10 miles under Mount DuBose at such a fast clip that the previous record for a week's advance in a bore of this size was broken not just once but five successive times. Both the contractor and the Aluminum Company of Canada, Limited, which conceived the bold scheme and will make use of the facilities being provided, have compiled summaries of the tunneling progress.

Meanwhile, concreting of the tunnel began a few days after the final breakthrough of the headings on December 3. It is now well under way, and major attention has been shifted to the completion of the remaining rock drilling in the mammoth underground Kemano powerhouse and its accessory openings, to the final work of stringing a 50-mile transmission line of unprecedented size from Kemano to Kitimat across the lofty arctic Kildala Pass, and to the construction at Kitimat of a smelter scheduled by midyear to begin turning out aluminum metal at the rate of 83,000 tons annually from alumina that will arrive in ships from Jamaica. The holing-through of the tunnel carried the Alcan undertaking into its third and final stage.

SUMMARY OF WORK DONE WITH CANADIAN I-R DRILLS

Location and Type of Drills	Total Footage
Power tunnel—DA-35's	
Kemano to Horetzky (east heading, 15,200 ft)	1,824,000
Horetzky to Kemano (west heading, 13,690 ft)	1,574,350
Horetzky to Tahtsa (east heading, 13,883 ft)	1,596,545
Horetzky Adit—DA-35's	189,240
Tunnel to Powerhouse area—DA-35's	
1600 level, adit and horizontal penstocks	166,016
2600 level, horizontal penstocks, access adit, valve chamber, etc.	102,429
Powerhouse area—DA-35's and CR-58 stopers	
Tailrace, access and cable tunnels, exploratory drilling, penstocks, valve chambers, raises, etc.	1,095,410
General construction—Jackhamers, wagon drills	
Roads, dams, transmission tower footings, townsite, etc. (estimated)	3,500,000
Total	10,047,990

The first stage ended in October, 1952, with the completion of Kenney Dam, a huge earth-and-rock barrier on the east side of the range that has halted the flow of the Nechako River system and will eventually back the water up 115 miles and feed it into the tunnel that leads westward.

The epic tunneling exploit was accomplished in less than 21 months. Underground driving started on March 16, 1952, at the eastern end and during the next three months at the western portal and at the midpoint—Horetzky Creek—where an adit first had to be thrust into the mountainside to intercept the tunnel line before headings could be turned both to the east and the west.

The crews working at the four points of attack each operated fifteen rock drills simultaneously from 3-platform carriages or jumbos 22 feet high. In an average round they put in 102 holes each 11-odd feet deep, which added up to more than 1000 miles for the entire job. Into the holes went 4,180,290 pounds of explosives to shatter 1,128,530 cubic yards of rock that weighed around 2,300,000 tons. A little less than one-fourth of the tunnel length—12,765 feet, to be exact—penetrated ground that was too unstable to stand alone and was supported with 1665 sets of steel. Most of the bad stretches were in the eastern half, where the line passes under a sizable lake. At the height of the operations, 692 men worked on the tunnel, 410 of them underground and 282 in supporting jobs outside.

Tribute was paid in the Morrison-Knudsen summary to the excellence of the surveys conducted by its associate concern, the British Columbia International Engineering Company. Working months ahead of construction in a remote elevated and rugged region that presented great physical obstacles, the engineers upheld the tradition of their profession by laying out the line so that the different sections excavated separately met almost exactly. Moving from east to west across the mountains, the surveyors projected the line for the main tunnel and the connecting penstocks at its western end from a base line, 11,000 feet long, that was run across the ice of Lake Tahtsa early in 1951. Carrying it on from there, they set up triangulation stations at various high points, some of which were accessible only by helicopter. Later, as tunnel driving progressed, the engineers in the four separate working sections extended the line underground from this original surface system.

The accuracy of the engineering control work was revealed last October 23 when headings in the main tunnel being advanced eastward from the Kemano

DATA ON TUNNEL-DRIVING RECORDS

	Kemano			Horetzky	Horetzky
		Kemano to Horetzky		East Heading Horetzky to Tahtsa	West Heading Horetzky to Kemano
	Sept 22-27 '52	Oct 16-22 '52	Oct-Nov 27-1 '52	Nov 24-29 '52	Feb 16-21 '53
Total footage (6-day week)	248	258	261	274	282
Total yardage (in place)	5,708	5,972	6,038	6,342	6,528
Number of drills	16	16	16	15	15
DA-35 power-feed drifters with 1¼-in. round steel and 2-in. Carset Jackbits					
Holes drilled per round	97	97	97	97	96
Number of rounds	23			27	28
Greatest day's advance, ft	50	54	55	55	61
Average daily advance, ft	41.3			45.67	47
Average advance per round, ft	10.8			10.15	10.07
Average cu yds per foot	23			22.5	24
Average cu yds per round	248			228.6	219.53
Average mucking time	3 hr. 1 min.			2 hrs. 38 min.	1 hr. 35 min.
Average no. cu yds	87.5			86.54	87.01
Average drilling time (per round)	1 hr. 33 min.			1 hr. 24 min.	1 hr. 34 min.
Total footage drilled (per week)	26,385			30,556	30,520
Average drilling per round, ft	1,147			1,132	1,090

VARIED TYPES OF DRILLING

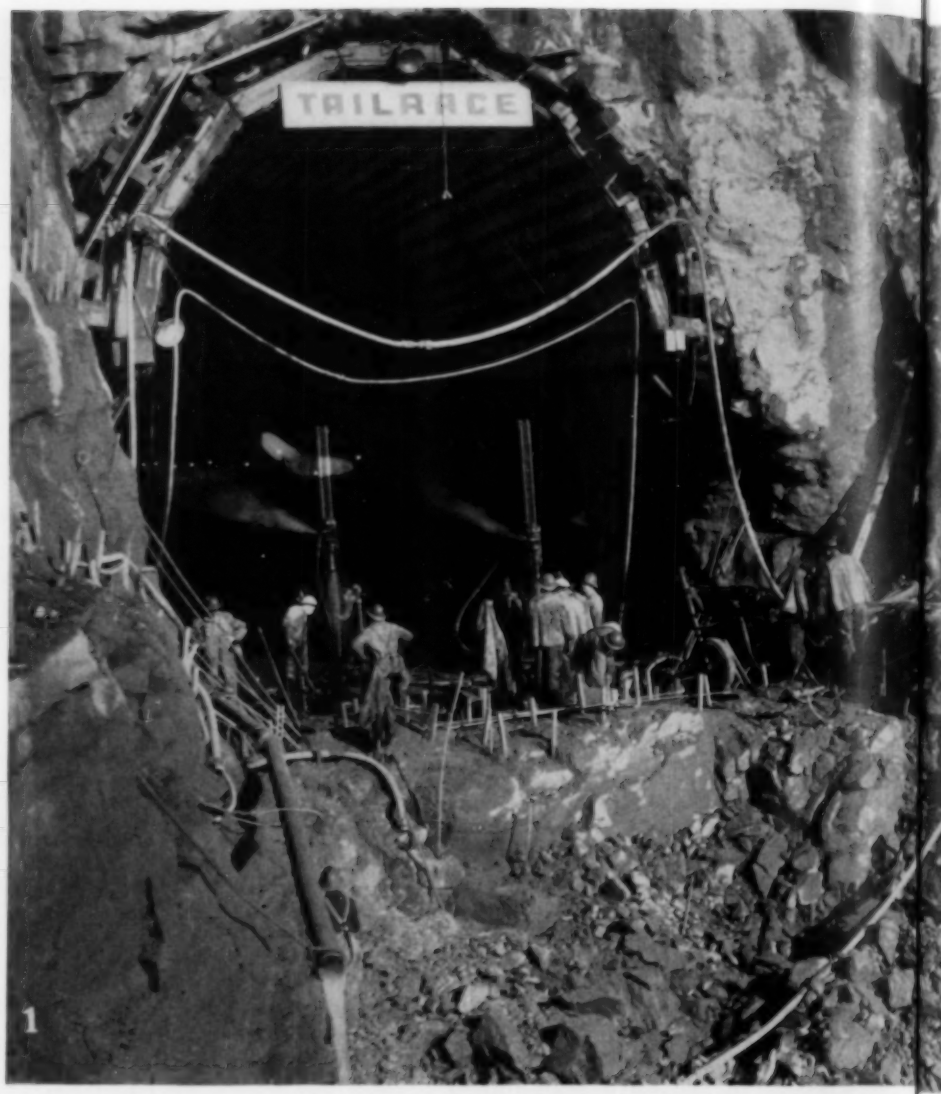
The most spectacular aspect of all Alcan drilling—the simultaneous operation of fifteen drifters on each of the main tunnel driving carriages—has been illustrated in previous issues. Here we see some other drilling setups.

1 The tunnel for the tailrace of the Kemano underground power plant was driven initially 27x27 feet in section so as to put its floor at the right level for use as an access haulageway during the powerhouse excavation period. When it was no longer needed for that purpose it was deepened 13 feet in preparation for its designed service of carrying water away from the turbines. This second excavation stage was executed by putting down vertical holes with X-72 drifter drills on wagon mountings.

2 A DA-35 drifter, mounted on a tripod, is shown starting a long hole in a tunnel for the purpose of checking the rock temperature.

3 The penstock tunnels, inclined 48°, were excavated by driving a pilot raise and then enlarging it to a diameter of 15 feet with carriages like the one pictured. The drills used were J-50 Jackhamers mounted on Jacklegs.

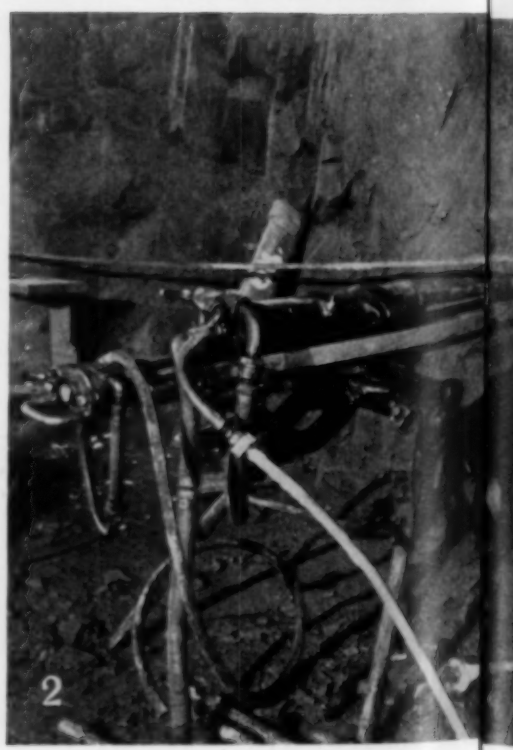
4 To withstand the arctic gales, the towers of the 50-mile transmission line from Kemano to Kitimat must be deeply rooted in rock. Here, at the bottom of an excavation pit for one of the legs of Tower No. 333, a 3½-inch hole for an anchor bolt is being drilled 10 feet 3 inches deep. The DA-35 drifter utilized is mounted on a horizontal bar that is supported by the vertical one at the right. The hole for the latter was put in by the J-50 Jackhamer shown at the lower-left.

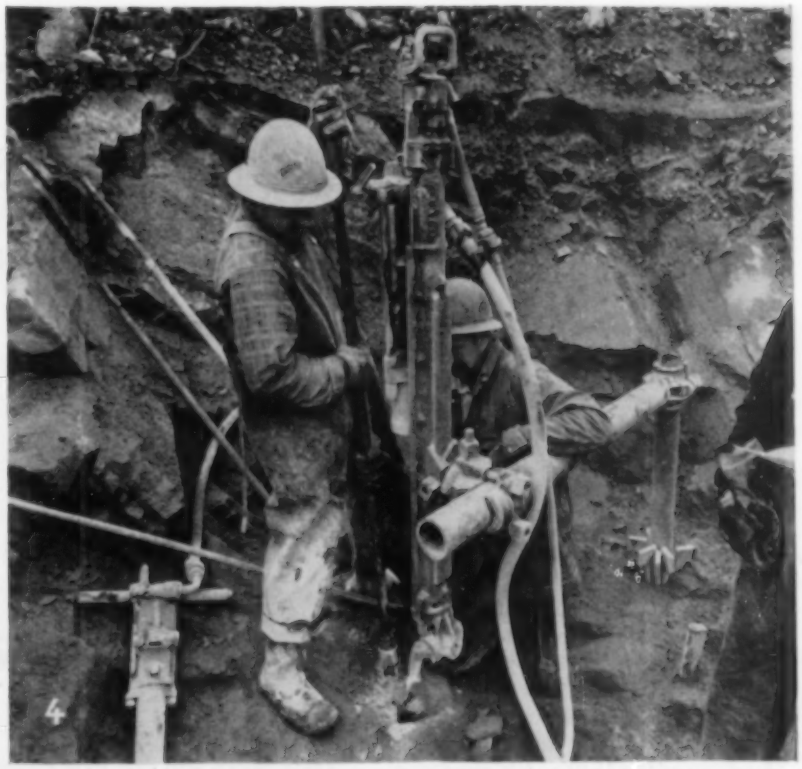


end and westward from the Horetzky Adit met with a deviation of less than 6 inches from perfect alignment and 3 inches from grade. These differences were less than the variations from true design dimensions that normally result from overbreak of rock during blasting operations. Similar near perfect coincidences were experienced at the final holing-through of the main tunnel and at the meeting points of the various sections of the penstock tunnels that were driven on an angle of 48° to connect the western end of the large bore with the Kemano powerhouse at the foot of the mountain half a mile below.

Another release of statistical information that emphasizes the vital part rock drills are playing in this great engineering-construction enterprise was made by Canadian Ingersoll-Rand Company, Limited. Its figures show that up to the first of this year the concern had supplied 280 rock drills for the various phases of the project, including 130 of the DA-35 drifters that have established all the new tunneling records previously referred to. The most recent ones, which rank as the current titleholders, were a mark of 282 lineal feet in a 6-day week (47-foot daily average) and one of 61 feet in 24 hours. In addition to their use in the main tunnel, the drifters were employed in excavating for the powerhouse and its related series of adits. Forty stopehamers were supplied, mainly for overhead work in penstocks and surge raises. Thirty wagon drills and 80 hand-held and Jackleg-mounted Jackhamers rounded out the I-R equipment. Many of these were utilized on the network of roads built to move men, machines and supplies to the widely separated working locations.

The company compiled a sort of box score of its own to summarize the work the drills had done up to January 1. It shows that they had put in a total of 1900 miles of blast holes to break a volume of rock that is estimated at 6,063,000 cubic yards and to weigh 13,640,000 tons. The major part of this total—3,600,000 cubic yards—resulted from roadbuilding and general construction operations throughout the project area. The main tunnel and incidental adits accounted for 1,363,000 cubic yards, and the remaining 1,100,000 cubic yards was taken from the powerhouse site. The table is reproduced here, as is also one that gives the vital statistics on the five successive record-breaking weekly advances made in the main tunnel.





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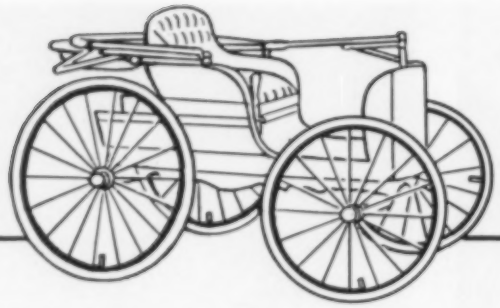
PIONEER IN PNEUMATICS



A. Schrader's Son Has Rounded out More than a Century

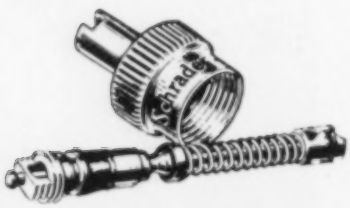
Robert J. Nemmers

Elastic belts our beaux prefer,
To show off well their muscles.
Our belles who wish to make a stir,
Wear India Rubber bustles;
American demands are great,
The article they're fetching.
It suits them well, I needn't state,
They're noted so for stretching!
Oh, the Rubber, the stretching India Rubber!

THIS stanza is one of many from *The Age of India Rubber*, a popular ditty of the 1840's. Charles Goodyear's discovery of the process of vulcanization in 1839 had made possible some phenomenal products that were setting the world astir. Besides elastic belts and inflatable bustles there were rubber pillows, mattresses, life preservers, shoe soles and aprons.

As in every new field, scores of other men turned their talents and imaginations towards developing products of rubber or of other materials to serve as accessory equipment. One such man was a young German mechanic who arrived in New York in 1840. He was venturesome August Schrader whose sole stock in trade was a keenly analytical mind. By 1844 Schrader was somehow able to open a small shop at 115 John Street in Manhattan and was thereby established as a manufacturer of daguerreotype apparatus, the forerunner of modern photographic equipment that was arousing much curiosity at the time. Shortly thereafter he entered into partnership with Christian Baecher, expanded the business and added to the sign over the door the words, "turners and finishers of brass."

The offices and warehouses of the booming rubber industry grew up around Schrader's little shop. Many of its problems were brought to him, among them a plea for a better way to admit air to and keep it in their inflatable creations. August Schrader took a keen interest in these matters and invented a valve that brought the rubber world beating a pathway to his door. His brassworks flourished. Old ledgers of the company are full of such notations as "95 life preserver valves @ $0.10 = $9.50" or "1 mould @ $2.50" for accounts such as



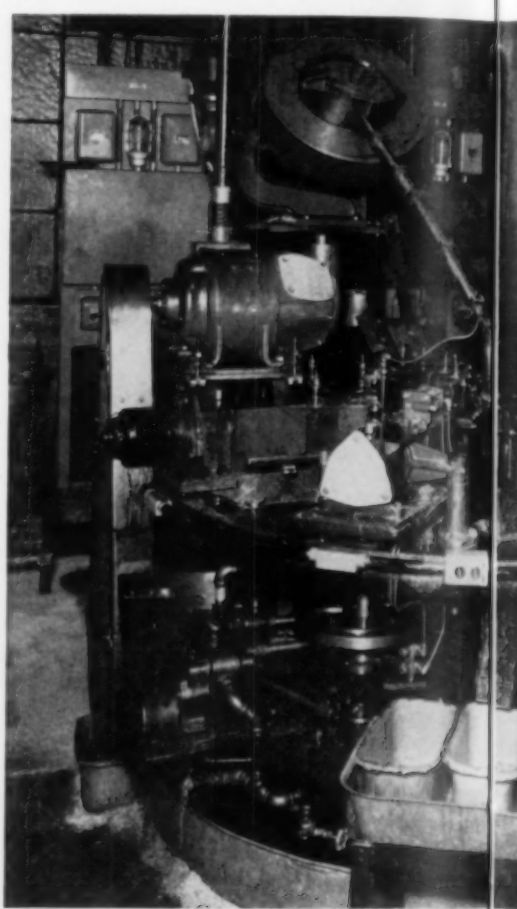
SCHRADER TIRE VALVE

Every person who ever rode a bicycle or drove an automobile has had experience with Schrader tire valves, which are standard the world over. Introduced in 1891, the valve underwent numerous changes until 1898. Since then the basic design has remained the same. The core and cap of today's valve will fit and work perfectly in the 1898 valve. The cap is guaranteed to seal in pressures up to 250 psi.

Goodyear & Ely.* Schrader valves were standard equipment on the pneumatic bustles of the day and, it is said, "never betrayed milady in a social gathering by a hiss of failure." This same oral (lung-power inflated) valve, with but a few modifications, is used today on inflatable life preservers and pillows.

A great deal was happening in this midnineteenth century world of August Schrader's—some developments having an immediate effect on his business and some to be long delayed. In those years John Wise was promoting interest in balloons—a boon for both the rubber industry and Schrader, the latter equipping them with valves and other fittings. Even today Schrader's corporate descendant—A. Schrader's Son—figures prominently in the field; it outfitted large numbers of barrage balloons for the Allies in World War II.

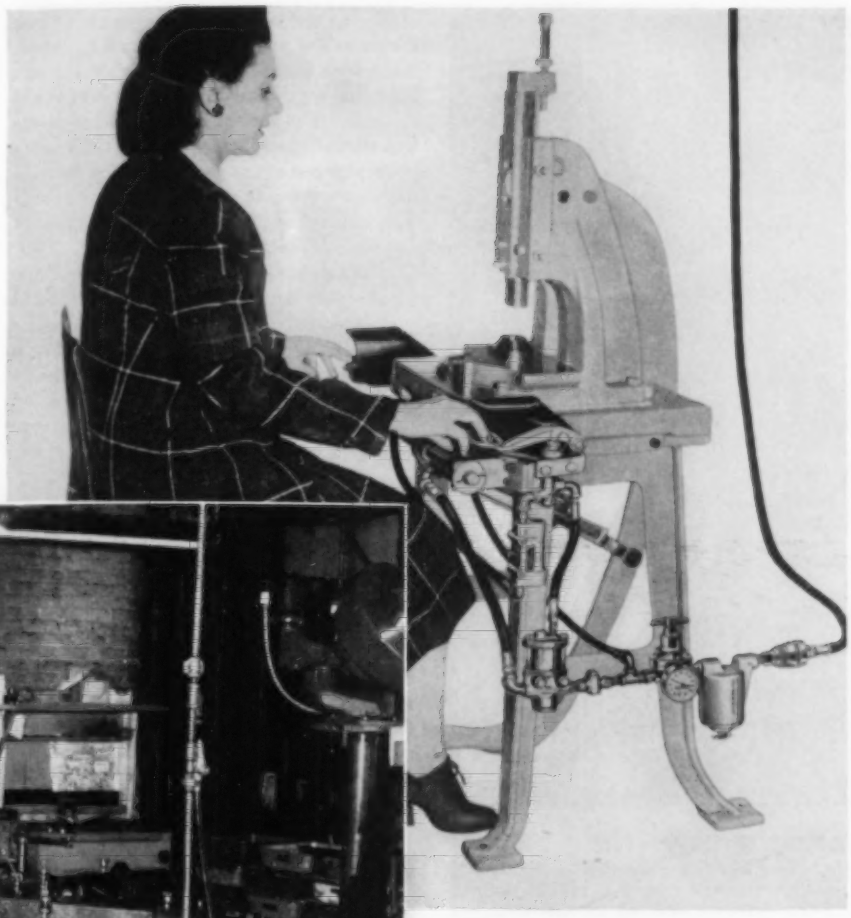
In 1849 when the country echoed to the cry of gold in California yet another gold field was attracting adventurous seekers of wealth. Underwater salvage operations had taken an upswing, and expeditions using the crudest forms of diving equipment were scouring coastal waters for sunken gold. August Schrader, when he saw one of the early-day diving suits, was convinced that he could improve upon it. He did, and in the same year the Schrader name first appeared on

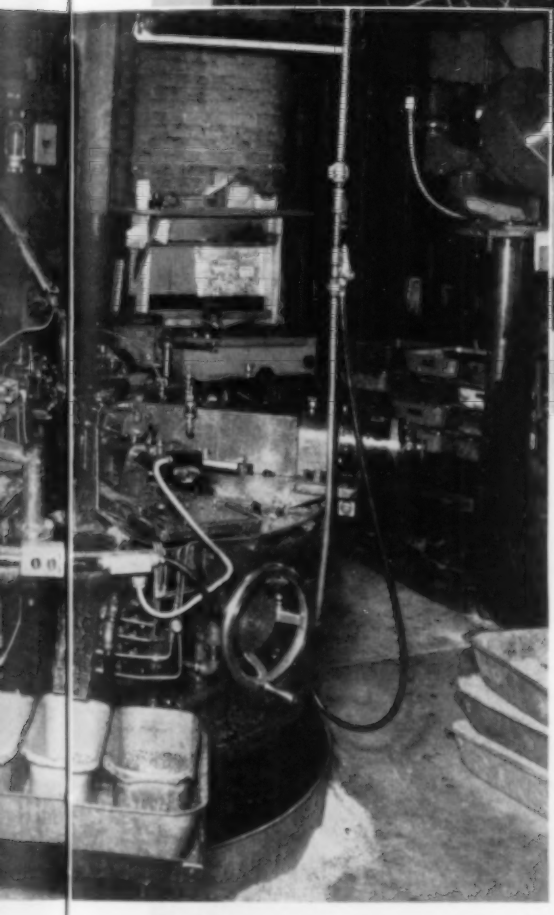


PNEUMATIC ROBOT

Air cylinders and controls make this round-table machine tool virtually automatic. Cylinders advance and retract the individual tools, operate chucks, load them from a magazine and eject finished work. The magazine is loaded from the revolving hopper at the top. The operation is controlled by timing cams. Guards were removed from the machine to take the picture.

*The firm of Goodyear & Ely was composed of Henry Goodyear and partner, Ely. Shortly after this notation was made in the Schrader books Henry dissolved the partnership and joined his brothers, Charles and Nelson, to found the Goodyear Rubber Company.





PNEUMATIC "FOOT"

The operator of the press shown above formerly had to depress a pedal to work the machine. A Schrader cylinder and appurtenant controls have eliminated that tiresome effort. As two hands are needed to operate the controls, it is impossible for the girl to get a hand under the descending ram.

two helmets made for the Union India Rubber Company. Today much of the deep-sea diving equipment in service throughout the world is manufactured by the company. What may well be one of the most widely known salvage jobs, the refloating of the U.S.S. *Lafayette* (the French luxury liner *Normandie*), was accomplished with the aid of Schrader diving apparatus.

Other developments during that period which were of no immediate importance but which were destined to play an important part in the future of the House of Schrader were the bicycle and the pneumatic tire. The bicycle was an invention of Kirkpatrick MacMillan of Scotland who added driving gear to a dandy horse—a 2-wheeled velocipede that was propelled by the feet—and thus gave man his first pedal-powered "bike." That steel-tired rig, soon to become known as the bone shaker because of its less-than-comfortable riding qualities, started a long train of developments that led to the first major use of pneumatic tires in 1888. The pneumatic tire was patented in 1845 by Robert William Thomson, another Scot, for an "improvement in carriage wheels which is also applicable to other rolling bodies." There was no move to adapt it to the few steam-powered carriages of the day, even though Thomson included the following statement in his description of the tire.

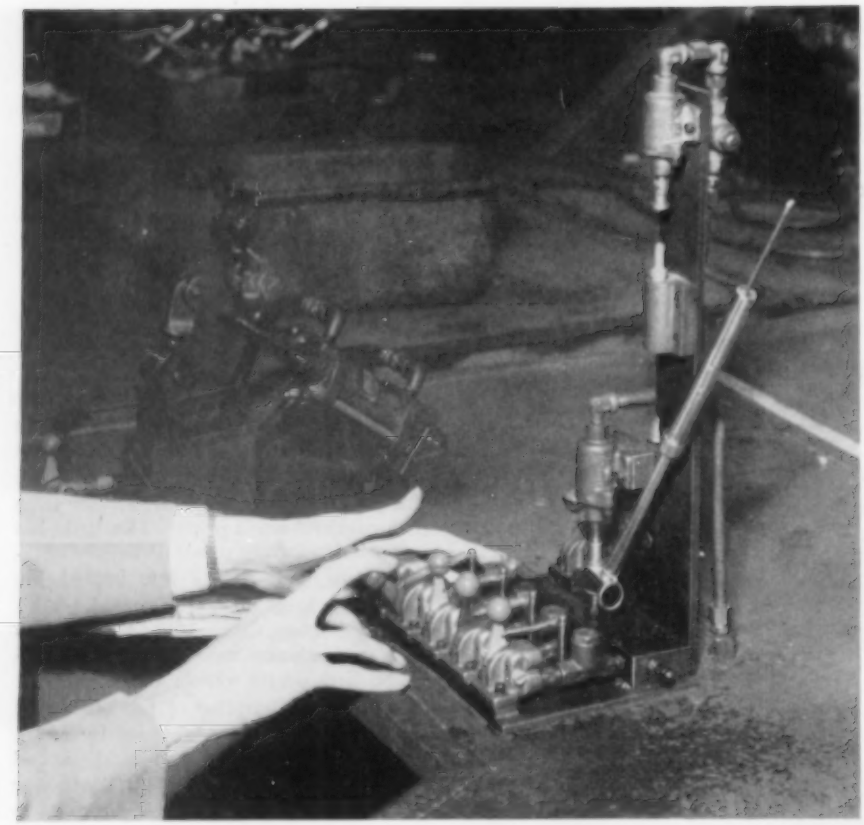
"The elastic belts are peculiarly adapted to carriages propelled by steam. The comparatively small amount of power required to propel carriages, the wheels of which are fitted with these belts, the steadiness of their motion, the absence of all jolting and consequent security of machinery from injury, the small damage the carriages will do to the roads, the absence of nearly all noise, the high speed that may be safely attained, and the great gentleness of motion will enable steam carriages to be run on common roads with great advantage both for carrying passengers and goods." Although Thomson probably did not realize it, he had visualized today's highways teeming with the automobiles and trucks so vital to the economy, comfort and defense of our modern life.

Thomson's invention lay unused for more than a generation, until the 1880's when Dr. John B. Dunlop rediscovered it. As a veterinarian, there was no reason for Dunlop to work on tires other than his youthful son's pride. The little lad reported tearfully to his father that bigger boys made fun of him because he could not keep up with them on his bicycle. Dunlop, without benefit of Thomson's experience, mounted a set of air-filled tires on its wheels and thereafter, much to the surprise of the older and bigger lads, and unhampered by rough cobblestone streets, his son outdistanced them all. America saw its first of these tires at a Niagara Falls bicycle race in 1890 where English riders using them outclassed all competitors.

That was a revelation and boon to the American rubber industry, yet there were many problems to be solved before tires became popular. Chief of these was the need of an adequate valve. In 1891 August Schrader came up with the answer, and by 1898 the organization had made changes in design resulting in the type with a replaceable core that has become the world's standard. In fact, although it has undergone many improvements since then, the core of today's tire valve still fits the valve of 1898. Such a degree of standardization has proved of inestimable value to the automotive, aviation, bicycle and tire industries. It was demonstrated more fully in both world wars when the cores and caps of tire valves used by the service forces of all the Allies proved to be interchangeable.

George H. F. Schrader, son of the founder, entered the business in the early years of the tire-valve development period and, specializing in the field's peculiar problems, led the firm into pioneer work on tire pressure gauges, air chucks for tire inflation, tire-valve tools, repair parts, etc. Today it is the foremost manufacturer of such devices, and the name of Schrader is familiar wherever tires are sold or serviced.

With the turn of the century, more and more products came into being that needed compressed-air valves and fittings. Among these were the automobile, the truck and the airplane. Schrader designed tire valves for all of them. Ear-



TESTING TIRE PRESSURE GAUGE

The gauge to be tested is set on a rigid tire valve stem connected to carefully regulated sources of air. A valve is then opened and the cylinder, visible just above the gauge head, clamps the head to the stem to form an airtight seal. The four valves seen in the foreground are then opened in turn, and each admits air at a different pressure so that the gauge can be checked at each one. The cylinder and valve arrangement at the top of the fixture is used to test the gauge in an inverted position.

lier inventions such as the Westinghouse air brake and the rock drill had introduced compressed air throughout the world, and compressors and allied equipment became increasingly popular. Later, with the advent of industrial air controls and cylinders, the company was able to put its many years of experience to good avail and began making many items of especial interest to users of air power.

Over the years, the works on Manhattan Island had grown until there was no longer room for further expansion. Accordingly, a new factory was erected in Brooklyn in 1913, and it is there that Schrader today manufactures products for world-wide distribution.

Some facts about the firm's corporate history may be interesting, for, like most industrial concerns, its present status is largely the result of capitalization. During the first 60 years the business was wholly owned by August Schrader and, in turn, by his son George H. F. In 1904 it was incorporated under the name of A. Schrader's Son, with the younger Schrader as the first president. In 1930 the controlling interest in the stock was acquired by the Scovill Manufacturing Company, and in 1935 A. Schrader's Son became a division of that organization.

Today's Schrader plant is a modernized and greatly expanded version of the 1913 Vanderbilt Avenue works. Typical of many factories in metropolitan areas, the building has reached skyward as much as it has spread horizontally, and now one of its wings is ten stories high. Even the roof is utilized, for it supports water storage tanks, cooling towers, air intakes, etc. The plant interior is arranged so that there is a minimum of cross flow. Raw materials generally move downward from the upper floors through the several stages necessary to convert them into finished items. The shipping and receiving departments are on the lower level, as is the engine room where much of the power used is generated.

It is only natural that a company engaged in the manufacture of compressed-air equipment should use many time- and labor-saving devices operated by that medium. Virtually every one of the varied motions in the production processes has been studied by Schrader engineers to see if the work could be expedited by a pneumatic cylinder. They point with pride to the literally thousands of these units already installed in the plant, yet new applications for them are continually being suggested. Each idea is carefully investigated, for it is in this way that Schrader first entered the industrial air-equipment and controls business. Many of its now well-known products were first developed for its own use and were put on the market when it was discovered that they were efficient adaptable tools.

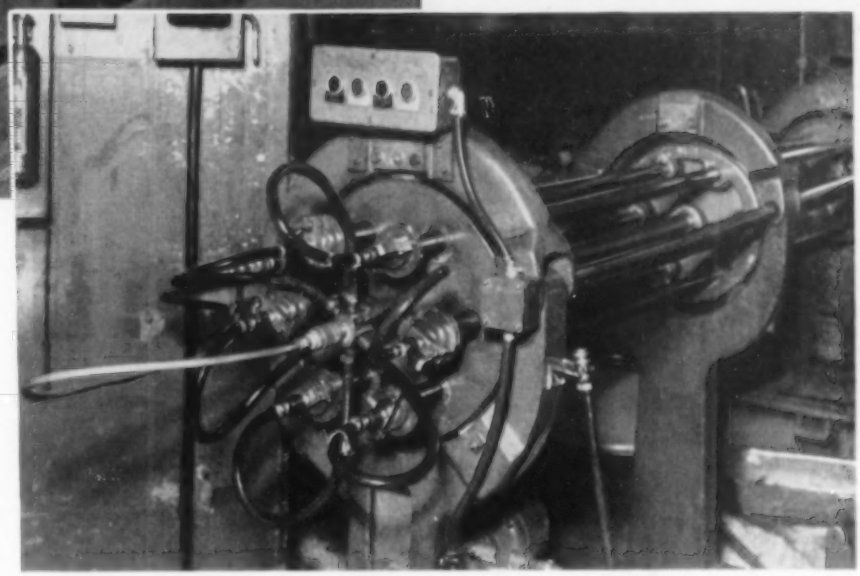
It is impossible in the space available to discuss, or even to list, the varied services performed by air power in the establishment, but a description of one or two operations in each of seven categories that have been arbitrarily selected will give a good idea of the wide range of air applications.

Raising and Lowering

One of the jobs that imposes a great strain on workers is the lifting and lowering of heavy articles, and authorities are agreed that lifting is responsible for most industrial and domestic back injuries. With an air cylinder such as the Schrader engineers have installed in the shipping room the work is done without physical effort. In one area, small products are packed by weight into boxes which are placed on the receiving end of a roller conveyor. The latter has a short section

ASSEMBLING HOSE COUPLINGS

The several parts of the coupling are built up in two adjacent jigs, one for each of the operator's hands. Then an Ingersoll-Rand Impactool, suspended from a spring over the jig, is set on the locking nuts one at a time and quickly runs them on.



AIR FEED FOR LATHE

A Greenlee 1-inch multiple-spindle machine tool (left) which successively performs several different operations on bar stock fed into it by compressed air. The picture below shows a revolving header by means of which the air is admitted to the feeding tubes. Each time the spindles index, a piece is finished. The bar stock in that particular spindle is then advanced the distance needed to make another piece, and machining continues. When the bar has been used up, the machine is shut down and reloaded by hand through the air-admission end.

that moves vertically to permit lowering empties to ground level for loading and raising them for transfer to the weighing, wrapping and stenciling stations. Lifting is done by a horizontal pneumatic cylinder through mechanical linkages.

Another hoisting job, which is novel because of the method by which it is controlled, involves the door of an oven that cures strip rubber in valve housings. The rubber serves to seal the valves, which are manufactured for pressure packages —dispensers of liquids of varying kinds. The oven functions at half-hour intervals, and an air cylinder, disposed vertically over the door, raises the latter and lowers it the instant a set of trays holding the work to be cured is admitted. Operation of the door is automatic and in sequence with the oven-cycling mechanism.

These applications demonstrate the ease with which pneumatic cylinders move heavy loads from one fixed level to another. But for lifting jobs that entail a high degree of selectivity of levels and positions, the factory is served by air-powered blocks and hoists.

Pushing and Pulling

Most modern machine shops are equipped with pneumatic cylinders to facilitate work involving short-stroke reciprocating motion. This is well demonstrated in the plant by a turret lathe that machines small parts from brass bar stock. With each turret cycle, the stock is advanced a predetermined length through a feed tube by an air cylinder, which retracts when the end of the bar is reached. Then the tube, which is split lengthwise, is opened by a pneumatic cylinder and another bar drops in from a magazine, which is similarly controlled. The feed tube then snaps shut and the bar-stock cylinder begins to function again. The reloading cycle takes so little time that the eye cannot follow it. The three turret-lathe cylinders are actuated by air pilot valves.

A variation of the pusher application is exemplified by a round-table machine tool with a number of fixed stations around a centrally disposed rotating chucking post. The work pieces are fed from an overhead hopper into a magazine, from which they are inserted into the chucks by an air cylinder. As the post turns, it is indexed so the different stations can perform their machining operations, and at the end of the cycle each chuck automatically opens and a quick "kick" from a pneumatic cylinder ejects the work. The individual tools on this machine also are advanced and retracted by means of air cylinders.

Blowing

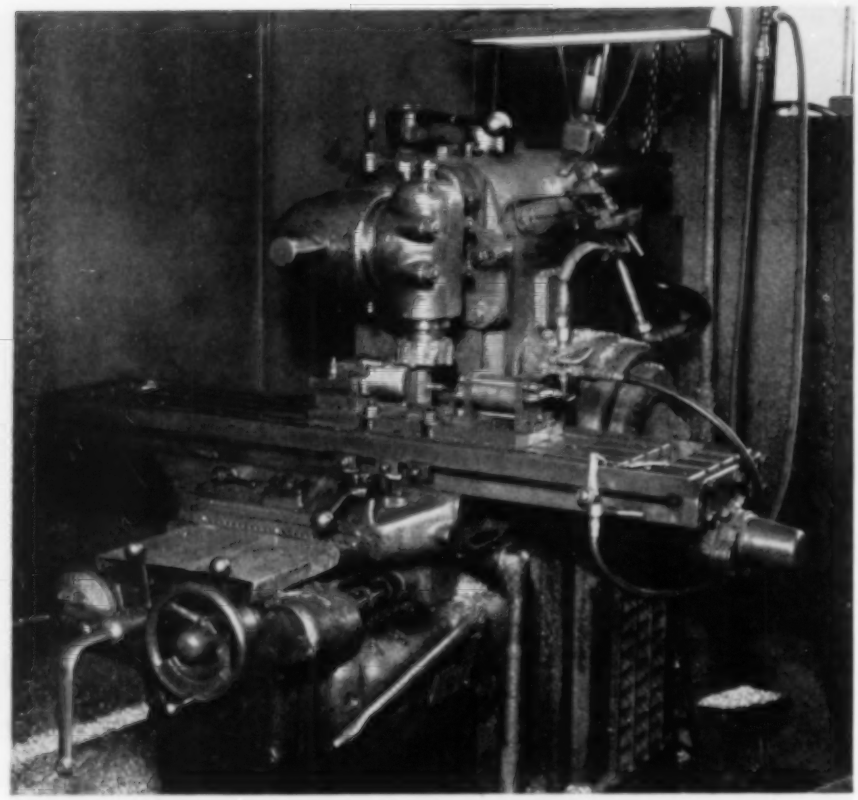
In addition to conventional blowguns, which are standard equipment in most machine shops for dust and chip removal, the company uses many air-blast press ejectors, which it also markets. They are turned on and off with each stroke of the machine and are therefore not wasteful of compressed air as are the devices that remain open and blow a stream of air across the dies all the time the press is in service.

Vibrators

Varied in-plant applications of vibrators were covered in the May, 1953, issue of this magazine. Schrader engineers, however, have come up with one that is novel and has saved much tedious hand labor on a machine that inserts a number of small rubber sealing washers in tire valve caps, using a fixture or jig that holds an equivalent number of caps. A big bottleneck in production lay in loading the jigs for that machine. Now each one is clamped, in turn, into a cradle hung from a small pneumatic vibrator, and the caps, which are dropped onto the fixture by aid of a scoop, find their own way into the holes as the jig vibrates. The cavities that are not immediately filled can then be taken care of by hand in a few seconds. As a result of this procedure, the unit production of workers has been increased by hundreds of thousands.

Clamping

Clamping is perhaps one of the most important jobs done by compressed air in the plant. In addition to the air operated chucks already mentioned, milling machines, valve-stem bending rigs and test fixtures, to name but a few, are equipped with speedy air clamps. Chucking is often used as an example when



AIR-OPERATED CLAMP

The hose that arches in horizontally at the right-center leads to an air clamp that holds a Schrader air cylinder in place while its base is being milled. Tripping a valve causes the clamp to grip the workpiece, and this one motion by the operator replaces the many that are required to manipulate a mechanical clamp. As there is a set of clamps for each different part milled on the machine, setup time is negligible.

demonstrating the fact that simple air-powered devices can save an almost disproportionately large amount of time and money. In the words of an advocate of air chucking: "Why pay a skilled machinist the present high rate of pay and then stand by and watch him spend an unproductive, major fraction of his time at the machine tightening, loosening and just plain 'fiddling' with a manual chuck?"

Pneumatic Tools

As is customary with the type of products manufactured by Schrader, there are a large number of threaded parts to be run together. This work and other operations are performed easily and quickly with pneumatic tools such as screw drivers, torque wrenches and impact tools, of which many are in evidence throughout the factory, particularly along the assembly lines. Air hoses leading to all tools are equipped with the company's own filter-lubricator units.

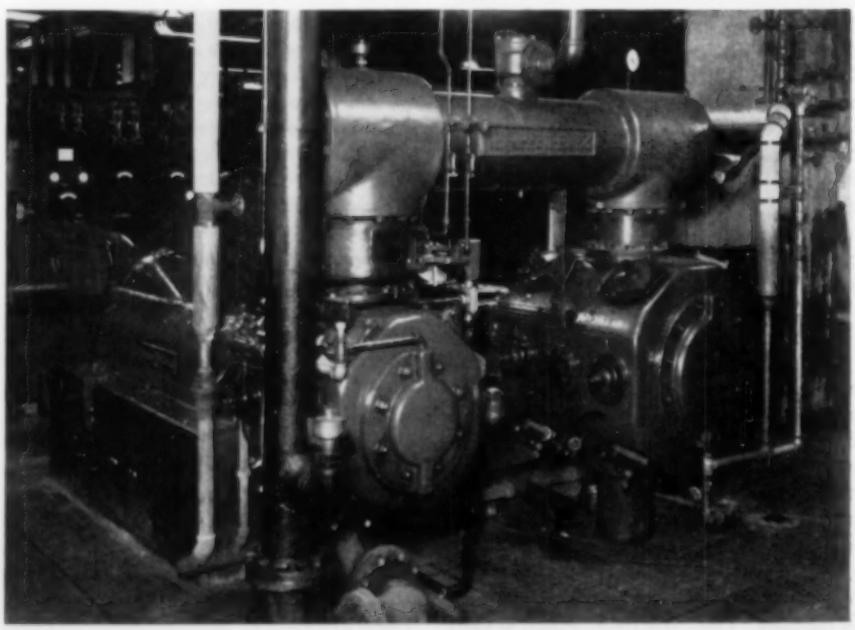
Aerostatic Testing

Because so many of the things made by Schrader's Son are identified with compressed air, that medium plays a vital role in testing them. Industrial valves, for example, are checked by attaching an air line to them and submerging them in water where they are observed for tell-tale bubbles that indicate leakage. The method of testing pressure gauges for tires is shown in an accompanying illustration and is fairly typical of the thoroughness of the procedures followed in checking other devices for accuracy.

Though not strictly related to the foregoing, it should be mentioned that the company compounds and vulcanizes all the rubber it uses. The tiny bits of this material needed in the manufacture of tire valves and caps and other products are of such great importance to their proper functioning that the firm set up a department of its own where it could do that work in order to maintain the rigid standards required.

Compressed air for the multitudinous services it performs throughout the plant is supplied by a number of compressors among which are two Ingersoll-Rand machines. One, an XCB Type, is driven by a General-Electric 200-hp direct-current motor and delivers general plant air at 100 psi. The other, an ES, is operated by an Allis-Chalmers 25-hp motor and furnished air at a pressure of 250 psi for test purposes. Both are 2-stage machines.

Through the years, Schrader engineers have found that compressed air is the most adaptable and most easily controlled power medium. As a result, the factory is equipped with thousands of time- and labor-saving pneumatic devices, many of which the company makes and sells, thus cutting production costs, increasing output and improving the quality of their products. Even the plant intercommunication system for written messages is of the air-operated type—a pneumatic tube conveyor.



ONE SOURCE OF AIR SUPPLY

Schrader uses a lot of air power in making its varied line of products for pneumatic services. Among the compressors that furnish general plant air at 100 psi pressure is this Ingersoll-Rand 200-hp belt-driven unit. An ES compressor of the same make supplies air at 250 psi pressure for testing purposes.

NEW IDEAS IN MILK AGITATION

●

Canadians Add Some New Twists to Our Method of Mixing with Compressed Air

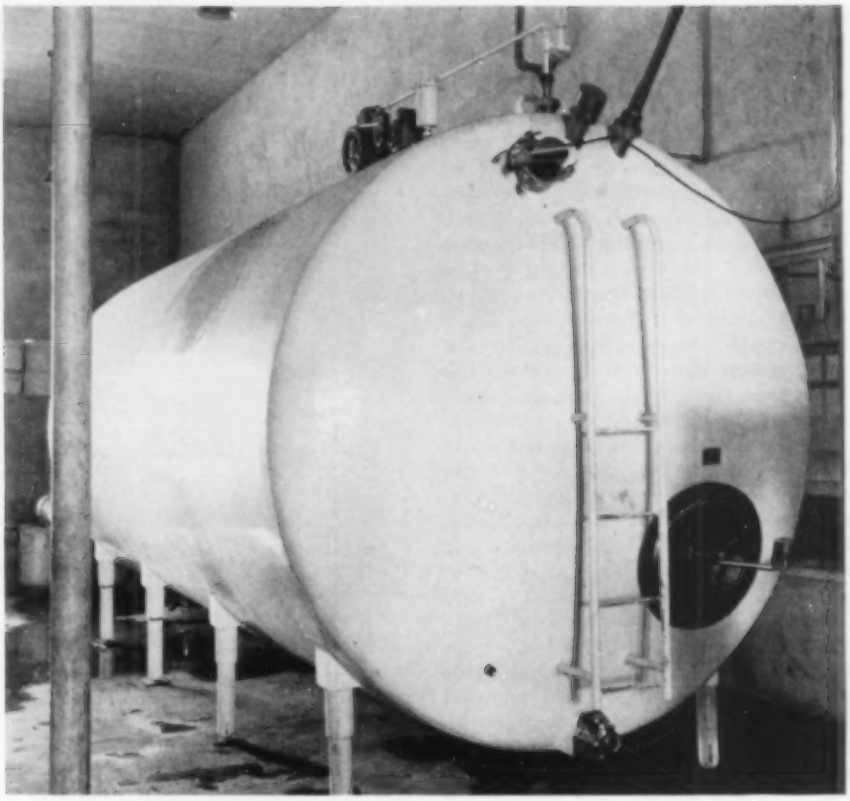
J. P. SMALLWOOD

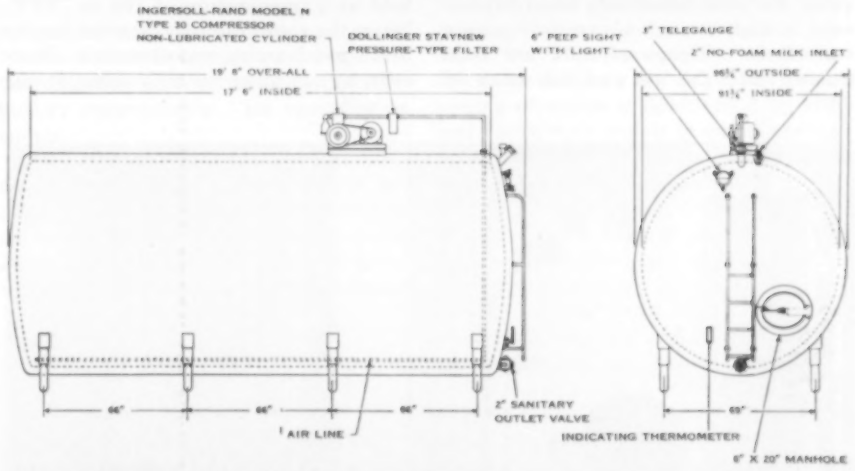
THE use of compressed air instead of conventional paddles for agitating milk while it is held for processing in dairies is growing steadily. An innovation a few years ago, the practice is now generally known among milk-plant operators in this country, and reports from Canada indicate that it is also gaining favor there. Not only that, but some new ideas have been introduced to the method across the border.

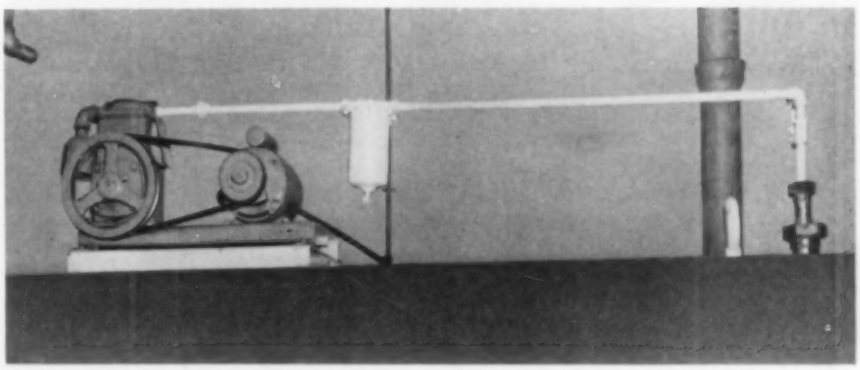
The original purpose of air agitation was to prevent contained butter fat from separating. Today it is apparent that it can also perform other services that promise to add to its value for milk processors of various kinds.

The St. Germain Cooperative, near Drummondville, Que., an important producer of butter, cheese and powdered milk, recently applied the method to a new 5000-gallon tank in which skim milk is kept until it goes to the drying machine. Besides agitating the milk, the oil-free air also mixes in a neutralizer that reduces acidity in the final product.

At the Laiterie Leclerc in Granby, another Quebec community, air agitates condensed milk that is used in making Purity ice cream. Although most milk tanks are horizontal and cylindrical in form, this one is rectangular. The shape makes no difference to an air agitator, but a mechanical appliance would have difficulty in reaching into the corners to insure good circulation. It is customary to mount the small compressor required on top of the tank and out of the way, but in this instance it is located outside







INSTALLATION AT ST. GERMAIN COOPERATIVE

Because the Model N compressor, which delivers oil-free air, requires little space and seldom needs attention it is mounted on top of the 5000-gallon holding tank, as shown at the top. It is belt-driven from a ½-hp motor with which it occupies a common base, as illustrated in the close-up at the bottom. The drawing gives details of the installation. Skim milk used in producing the powdered variety is held in the tank until it can be processed in a drying machine.

of the room and the air is brought in through ceiling lines.

A typical air-agitation system utilizes a ½-hp motor-driven, air-cooled machine. To prevent contamination from oil, the compressor piston is equipped with graphitic carbon rings that do not have to be lubricated. As a further safeguard, the air is passed through a Dollinger pressure-type filter before it enters a perforated pipe laid along the bottom of the tank. In rising from the openings, the air mixes with the milk, the lower and lighter aerated liquid rising and pushing that above it to the sides. The latter then sinks and is, in turn, given a lift. Steady circulation is soon set up.

The size of the tank does not affect the functioning of the system. It works equally well, for example, in a long or short holder, and only one compressor is required in either case, whereas two mechanical agitators—one at each end—are usually needed in a long tank of, say, 7000 to 8000 gallons capacity.

When the fluid level in a tank drops below the height reached by a blade agitator as it revolves, air is whipped into the milk. Strangely enough, air introduced for agitation does not remain in the milk but is liberated as the liquid comes to the surface and rolls to the sides. Air is entrained only when its pressure is high enough to produce severe turbulence. Drops of milk are then thrown into the air and fall back in miniature splashes. It is a simple matter, of course, to adjust the pressure so that this will not happen.

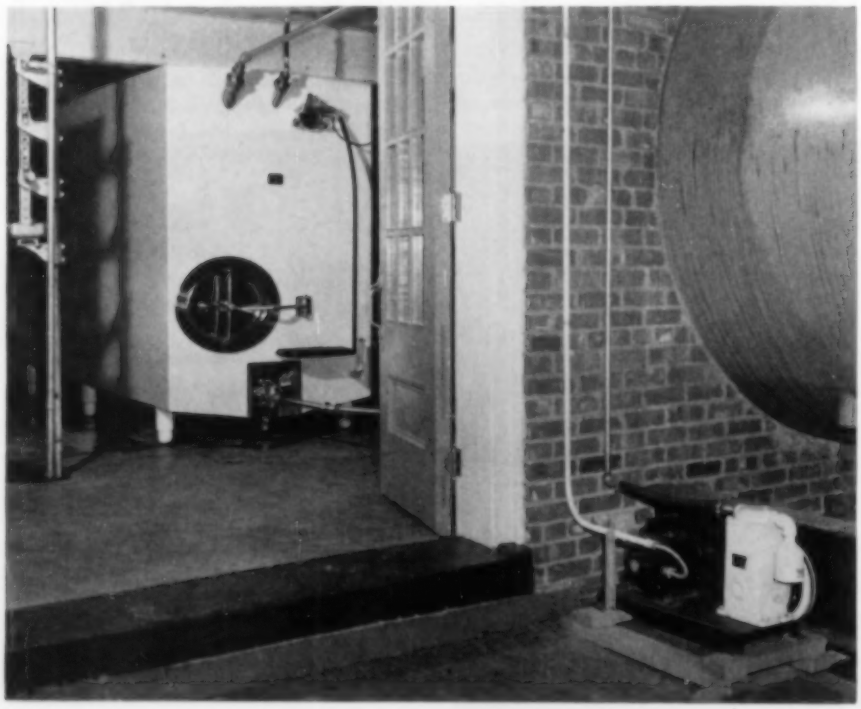
THE DAIRY AT ST. GERMAIN

Foam control is a problem at the St. Germain Cooperative, where the milk is held at a temperature of 160 to 170°F. When the compressor was started for the first time, foaming was excessive. However, by adjusting the air volume, it was reduced to about the same amount as that caused by mechanical agitation. There was still enough air, however, to produce complete agitation at all liquid levels.

Economy is a welcome factor in air agitation. It takes only 2½ to 5 minutes to set up agitation in a tank of milk, as against a minimum of 20 minutes with the average mechanical installation. The latter requires from 2 to 3 hp for a 4000-gallon tank, whereas ½ hp will do a thorough job with air. Aside from this lower consumption of direct power, less energy is dissipated in the form of heat during the process. Consequently, where it is necessary for the milk to remain cold, the refrigeration system has less work to do.

Oil-free air can be used to advantage in other ways in dairies. For instance, it will speed up the transfer of milk from tank cars to storage merely by applying enough pressure to the surface of the liquid to push it through connecting pipes. It also serves to blow out pipe lines, thus insuring complete discharge of the milk and contributing to cleanliness. Further, it is useful in moving heavy commodities like sour cream, buttermilk and ice-cream mixes from storage tanks to processing units.

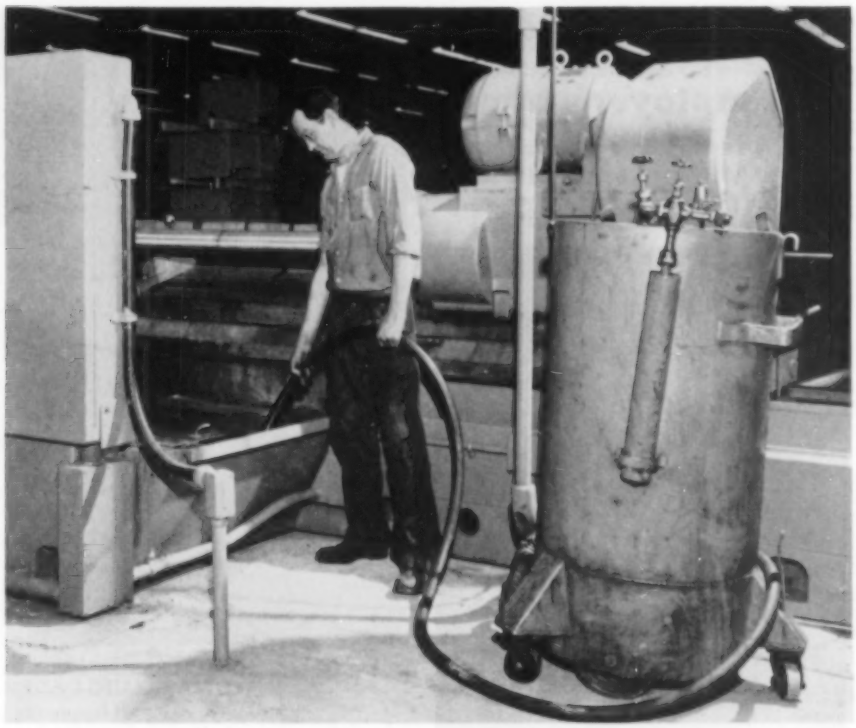
Another application, and one for which oil-free air is used in other branches of industry such as chemical processing and petroleum refining, is that of opening and closing valves in automatic instrument control systems. For this purpose clean air is vital to prevent clogging and to assure positive action. Valves of this type are found in dairies on timing pumps and on those that handle the hot water and brine in circulating systems for the pasteurizing process.



RECTANGULAR TANK INSTALLATION

Milk holding tanks are usually of round section, but at the Laiterie Leclerc, in Granby, Que., condensed milk used in making ice cream is stored until needed in one shaped like a big rectangular box. Under agitation with air, however, the circulating fluid readily reaches into the angles along the bottom edges and eliminates "dead spots." In this dairy the compressor (lower right) is located outside the holding-tank room and the air is piped in.

Removing Swarf with Compressed Air



EASY TO OPERATE

The swarf collector is pulled around the shop until filled and then wheeled or carried by lift truck or crane to the disposal point. Compressed air to fill and empty it is taken from the plant distribution lines.

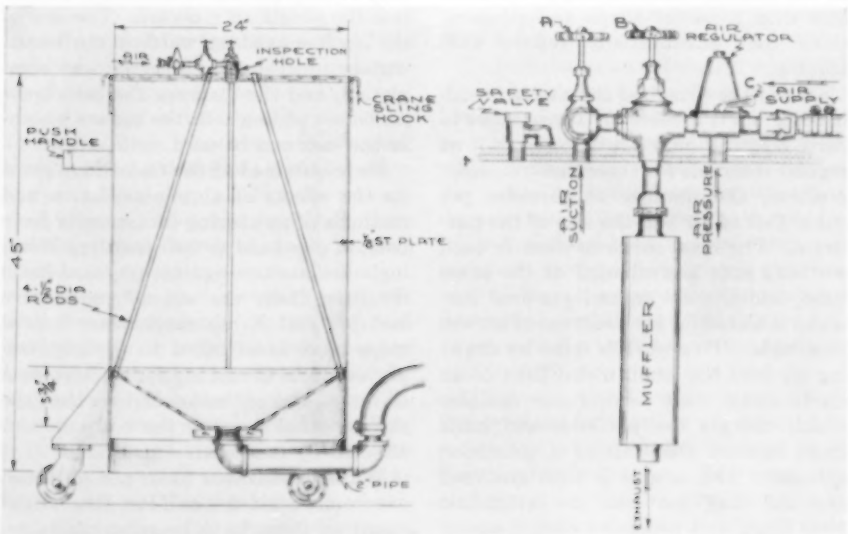
ORDINARILY, swarf removal in a production grinding department is a messy operation but that is not the case at the Grinding Machine Division of Norton Company, Worcester, Mass., where the job of cleaning out coolant tanks is not considered a dirty one. The reason for this lies in the use of a portable disposal tank that was specially designed as a result of the factory manager's request for an improved method of removing sludge from the coolant tanks of the many and varied grinding machines installed there. The work was formerly performed by electrically powered gear-pump tanks and was interrupted by frequent breakdowns involving high maintenance costs.

The new unit can be moved easily by hand; towed, pushed or lifted by power fork trucks; or carried by an overhead crane. Manual operation is virtually limited to opening and closing a few valves, and the medium that serves to transfer the liquid is compressed air at about 90 psi. It is supplied at the plant by a 50-foot hose, and a 20-foot intake and discharge hose is attached to a 2-inch pipe at the bottom of the tank. The unit pictured holds approximately 50 gallons and was designed to meet Norton's needs but can be modified without difficulty in accordance with other factory requirements. Its operation is simple.

To drain the fluid from a grinding-machine coolant tank through the intake hose into the disposal tank it is necessary to draw a vacuum on the latter. That is done by first closing air valve "C" shown in the drawing and then opening by-pass valve "B" and gate valve "A." The control point of efficient discharge is the air regulator, the proper setting of which is determined by trial and varies with the air pressure, the size of the pipe and the tank, and the nature of the sludge. The regulator serves only when the tank is pressurized to force the liquid out. That is effected by closing by-pass valve "B" and gate valve "A" and then opening valve "C."

The grinding fluids used on the machines serviced by the pneumatic disposal tank are all of the water-soluble or water-emulsion type—they are not straight grinding oils. The heavier swarf that usually accumulates in the coolant tank was found to be no obstacle to the efficient operation of the unit because most of it can be removed. But a small amount of densely matted residue, which collects at the very bottom, must still be taken out by hand. The quantity varies with the degree of matting and the nature of the metal chips. Periodic reverse flushing with a hot-water detergent followed by a hot-water rinse easily washes away the deposit on the tank wall.

In reporting on the performance of the new equipment, the company says that it is capable of removing 50 gallons of swarf from any grinding machine in four minutes and that the disposal tank itself can be emptied in 2½ minutes, or at the rate of 20 gallons a minute. Because no moving parts are used in the actual transfer of the liquid, maintenance cost is low.



DETAILS OF EQUIPMENT

By evacuating the tank, coolant and swarf are drawn into it from grinding machine reservoirs. To dispose of the material, air pressure is applied to force it out. The right-hand sketch shows the piping arrangement and the valves that are manipulated to accomplish these purposes.

Safeguarding Employees at Westinghouse

PNEUMATIC UNLOADER AND FLOOR SKID TESTER

The industrial-hygiene staff frequently takes advantage of engineering knowledge to discover and alleviate hazards. For example, to avoid harmful consequences in unloading powdered flint, feldspar or clay, it specifies a pneumatic conveyor (above) that sucks up the material at the rate of 6 to 8 tons per hour. Workmen are not exposed to the dust, either then or while the materials are in storage in huge silos. To test the slipperiness of floor waxes, the engineers built the artificial heel shown in the other picture. By measuring the distance traveled by a 2-inch-square felt pad at the end of the wooden leg before it loses traction and gives way on the floor, they learn how easily a person might slip and fall if any of the waxes tested were to be used.

INDUSTRIAL ailments were responsible for the loss of less than one man-hour out of every 100,000 clocked by Westinghouse Electric Corporation employees in 1952. Credit for this achievement goes to the company's hygiene engineers and physicians who are doing everything possible to eliminate causes of occupational illnesses that decrease production through reduced efficiency and lost man-hours.

The job of detecting offending substances before they can do damage is not always an easy one because they may be invisible or affect only certain workers with undiscovered allergies. Consequently, it is necessary to resort to many methods of attack, which are based at Westinghouse on a comprehensive card-filing system. The staff of the hygiene division, made up primarily of laboratory technicians, chemists, engineers and radioactivity specialists, catalogues all materials that enter into manufacturing processes and personnel equipment. Numbering more than 7000, the substances are carefully scrutinized for evidences of toxic or other qualities that may harm workmen. Everything from goggles to paint thinnners and types of steel is carefully listed after being checked either in the laboratory or by materials engineers. For example, if a new solvent is introduced, the liquid is analyzed. If found to possess injurious or irritating properties, they are recorded and shop supervisors are notified.

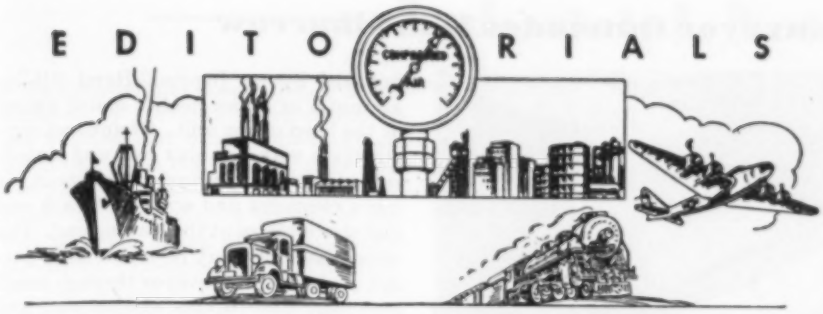
Soaps, hand creams and similar products are investigated by the use of meters, chemical analyses and even the everyday act of scrubbing hands. In this way it is possible to determine the percentage of scouring agents in detergents, their alkalinity, latherability and water-softening qualities, as well as the presence of irritating substances, and thus to select soaps and preparations that substantially reduce skin trouble.

One of the principal threats to health is dust, and it is therefore the practice in each Westinghouse plant to check it at regular intervals for three factors: composition, the number of particles per cubic foot of air and the size of the particles. The dust concentration in each worker's area is evaluated at the same time, and the air around gas-fired furnaces is tested for the presence of carbon monoxide. This work is done by drawing air into the small metal tube of an electrostatic dust and fume sampler which charges the particles and hurls them against the wall of a grounded cylinder. The sample is then analyzed and the tiny particles are magnified 1000 times and projected onto a screen for observation. If the concentration is found to be above a specified level, a protective device such as a hood is installed over the machine or, if supplemental ventilation is impracticable, the operator is required to wear a respirator.

Knowing that slips and falls account for about 25 percent of all industrial accidents, the experts have fashioned a device for measuring the slipperiness of waxed floors. The contrivance has a hinged leg with a leather or felt boot that approximates in size the heel of a woman's shoe. Downward pressure of only twenty pounds is sufficient to simulate the weight of a person. The end of the leg is moved outward on the waxed surface until it slips or gives way completely, and the distance the boot travels before sliding tells the testers whether the wax can be used with safety.

Data obtained at the Oak Ridge plant on the effects of atomic radiation and methods of measuring its intensity have been of great aid in safeguarding Westinghouse workers against physical harm resulting from the use of radioactive isotopes and X-ray machines. Special steps have been taken to prevent employees from breathing radioactive dust or fumes and to make certain that the skin or other parts of the body are not affected by radioactive materials.

While all hazards have not yet been overcome, accidents and lost time on account of them have been markedly reduced by the industrial hygiene staff, and in view of what it has already achieved it is perhaps not too hard to believe that occupational ailments will some day be well-nigh eliminated.



THE ROSY FUTURE

OUR grandparents worked twelve hours a day, six days a week and were rewarded with little pay and less in the form of the comforts and conveniences of life as we now know them. It was probably a good arrangement for that period, because spare time must have hung heavily on their hands. Nowadays, in contrast, most people work 40 hours a week or less for wages our forebears would have considered fabulous, and the trend is towards still shorter hours and higher pay.

People have to have more money and more leisure than formerly because there are more things to buy and it takes lots of time to ride in automobiles, look at television, play bridge or canasta or engage in any of the other current typical American pastimes or diversions. Yesterday's luxuries are today's necessities, and, with the new outlook on life, the average family has a lot of necessities.

Leaders of government and business, sociologists and scientists all seem to think that this is as it should be. We can, we are told, enjoy ourselves as we go along and not have to live in fear of the proverbial "rainy day" because we now have so many "built-in" security safeguards that it is difficult to spend our old age in penury. Insurance, hospitalization benefits, pensions, old-age security and other things to fend off old man adversity are provided by industry or the Government. People once hoped the Almighty would take care of them in their old age; now they look to their employers and that great invisible benefactor in Washington. And the average man in the street assumes that there are bottomless barrels of money in both places.

Businessmen and governmental officials know, of course, that in the final analysis all this bounty comes from the coffers of industry. As Sinclair Weeks, Secretary of Commerce, said recently, "private industry and not Uncle Sam is the real Santa Claus. Whatever money Uncle Sam puts in the Christmas stocking must come from the profits of private enterprise." It's a fine arrangement for everybody as long as industry can pay the bills. That's why it is necessary, even imperative, that business and employment shall remain at a high level. Minor peaks and valleys are unimportant, but a prolonged slump would have serious consequences.

Fortunately, we are told, there is little possibility of more than a mild recession. The industrial machine has such momentum that it will take all the curves and grades ahead of it with little slowdown. Fuel for its boilers is insured by the steady flow of new ideas from the research laboratories. To quote Mr. Weeks again, "the secrets of science are being unlocked by government and private research and are being used to give society new methods, new products and new uses for old products. These innovations and discoveries are important factors in the nation's amazing economic growth."

Since 1940, and admittedly stimulated in part by defense needs, the sums spent for research by industry and Government have increased tenfold. Expenditures in 1954 are expected to reach four billion dollars. The greatest current reflection of this endeavor is found in the splurge in electronics. Devices and processes based on this new science are increasing mechanization of factories at an astounding rate and also introducing it into offices and homes. Its effects are sure to be far-reaching. In the offing, waiting to make its dramatic entrance, is nuclear power. Within the next ten years or so many startling developments may come from it.

To paraphrase an old saying, we should praise the laboratories from which all blessings flow. As a result of their outpourings, we are informed, productivity will soar to unbelievable heights. Skilled workers will get more money than they do now and will perform their tasks in fewer hours and with less drudgery and boredom. Increased leisure will spur recreation, travel, construction and self improvement. And new products, as they always do, will stimulate new by-products and services and create new jobs.

"Today," Mr. Weeks reports, "half the working population is engaged in making or selling things unheard of at the turn of the century. The mind can scarcely grasp the job opportunities of tomorrow when electronics, atomic power and solar energy are all concentrated on the pursuits of peace and happiness."

If half of these rosy predictions come to pass, future generations are going to have things pretty soft, to say the least.

RAGS TO RICHES?

WHAT to do with mill tailings resulting from the concentration of ore has long bothered mining men. In the early days in the West the outpourings of crushed rock were usually permitted to run into streams, but those days have passed. The silt and slime gave previously crystal-clear creeks an ugly milky cast and quickly killed the once plentiful trout population.

Nature lovers and sportsmen protested vigorously, but in vain. Their complaints could be brushed aside with impunity, but not those of farmers whose croplands were being slowly ruined by deposits carried on to them by irrigating water. When ignored, these settlers sometimes obtained court injunctions to halt the damaging practice. In time, the legislatures of all the important mining states passed laws requiring companies to build retaining ponds for their tailings or take other suitable steps to end the contamination.

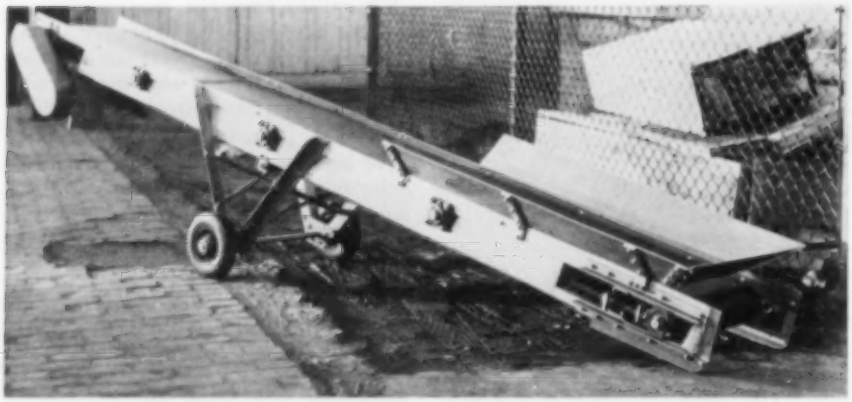
At present some of the larger mines send part of the tailings back underground to fill worked out stopes and thereby prevent caving. Now another disposal idea is being suggested. The farmers who once couldn't see any good in the ore refuse are learning that it may be helpful to them. Land that has been cultivated for a long time gradually loses its valuable mineral constituents and crop yields decline.

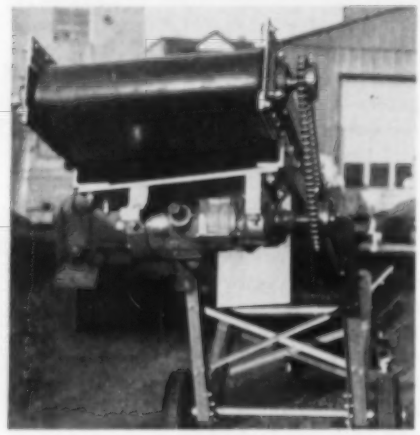
In plants, as in the human body, nitrogen, phosphorus, potassium and calcium are essential growth elements, and smaller amounts of some others are highly beneficial. Plants are better able than people to assimilate these substances and can gather those they need with high efficiency, even pick up some that occur in the soil in such small traces as 1/5000 of 1 percent.

Cobalt and zinc, it has been shown, are required by healthy plants and vegetable growths and are such capable chemists that they can convert both these metals into forms they can absorb. Entering into the process is a catalyst, sulphur, which is probably brought to the soil by rain. If a plant's quota of zinc is lacking, the seed will not reproduce. Thus nature controls the perpetuation of species. Those that fail to get proper mineral nutrition to bring them to maturity die without progeny.

The Denver Mining Club recently heard Andrew Sweet of the U. S. Bureau of Mines talk about these things and suggest that some day the miner and the farmer may get together. When the soil in eastern Colorado, which now yields great quantities of sugar beets, alfalfa and other crops, eventually becomes deficient in minerals, the once despised mine tailings may revitalize it. In time, the miner may even be paid for the mill discard that has been a burdensome expense in the past.

Aluminum Conveyor Outmodes Wheelbarrow





EASY TO MOVE AROUND

Two views of the new portable belt conveyor showing the removable wheel assembly and the hopper (top) and the head or drive end (bottom-left). The motor is mounted underneath the belt where it is always protected. The one pictured is an Ingersoll-Rand 2½-hp air-operated unit.

AN ALUMINUM trough belt conveyor of light weight, the Farnco SM, for handling all kinds of materials is being offered by L. S. Farner Company, which claims that it is more efficient than other similar equipment designed for the purpose. It is provided with wheels for portability and may be powered by an Ingersoll-Rand 2½-hp air motor or by an electric motor placed at the head of the unit. Of antirust construction with a rubber belt and sealed-in antifriction bearings throughout, it has a clean-out and scraper at each end and shock plates at the loading end. The wheel assembly may be removed to permit pushing the conveyor through small openings, blast-furnace tuyeres, etc., and there are handles to facilitate carrying. Multiple units have been used in steel mills to remove flue dust and brick refuse from checker chambers, and on construction jobs the SM has delivered concrete from ready-mix trucks directly to elevated forms. The conveyor comes in 12-, 16- and 20-foot lengths, all 16 inches wide. *Circle 1E on reply card*

Contest Announcement

Winners of a competition sponsored by Carter Controls, Inc., will receive awards for reporting new, unique or unusual applications of pneumatic or hydraulic cylinders that can be shown to have reduced costs, increased output or produced other benefits. Entries may be made up to January 1, 1955, and the winners will be announced in April. Entry blanks and full information may be obtained from the company at 2800 Bernice Road, Lansing, Ill.

Retired Engineer Builds Drill Models

WHAT do men think about after they retire?

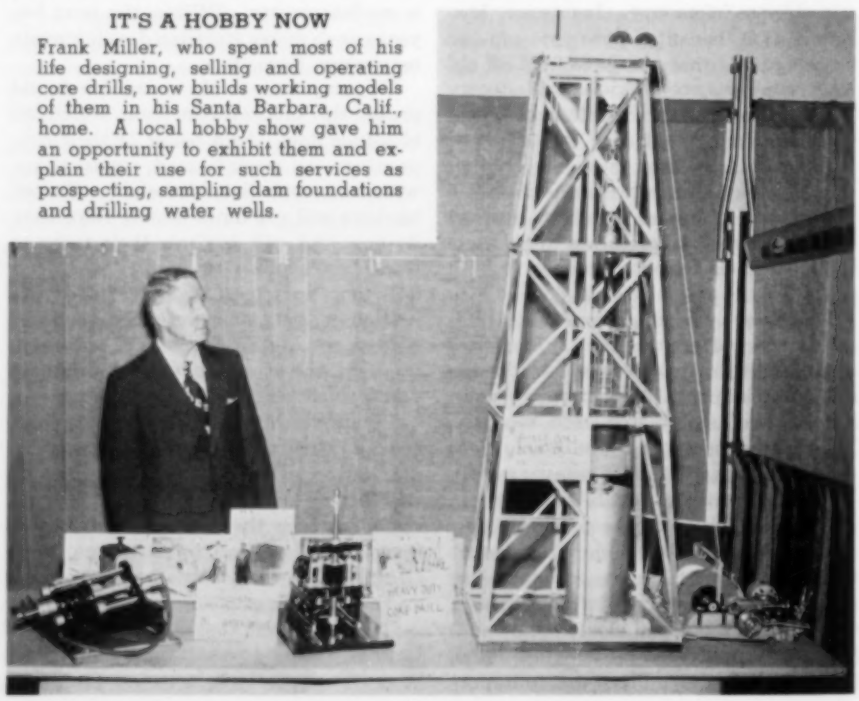
Some retain a keen interest in whatever they did during their earning period. In the latter class is Frank Miller, for years engaged in designing and selling core drills for Ingersoll-Rand Company. Among other activities since he retired to California, a few years ago, he now builds miniature working models of the drills he knows so well. He is shown here with some he exhibited recently at a 3-day community hobby show in Santa Barbara.

The model on the left represents the builder's idea of a machine that could be used to bore horizontal or slightly inclined holes into elevated areas in search of either oil or water. Equipment of this sort now available will penetrate only about 1100 feet, and Mr. Miller believes this can be bettered. The unit in the center is a miniature heavy-duty diamond core drill. The large display on the right is Mr. Miller's conception of a Calyx shot drill for putting down holes, 6 feet or more in diameter, for mine ventilation or to serve as a pilot opening that could be enlarged into a working shaft. Supported by a derrick and suspended on a line passing over the sheave wheels at the top and winding onto the drum of the hoist at the lower-right, the cylindrical cutting element and core barrel, together with the driving motor just above it, would be lowered progressively in the deepening hole.

On the table in front of the exhibitor are photographs of large cores of rock extracted from dam foundations and other construction sites by Ingersoll-Rand Calyx drills that Mr. Miller designed and frequently started up for customers the world over during his years of active duty.

IT'S A HOBBY NOW

Frank Miller, who spent most of his life designing, selling and operating core drills, now builds working models of them in his Santa Barbara, Calif., home. A local hobby show gave him an opportunity to exhibit them and explain their use for such services as prospecting, sampling dam foundations and drilling water wells.

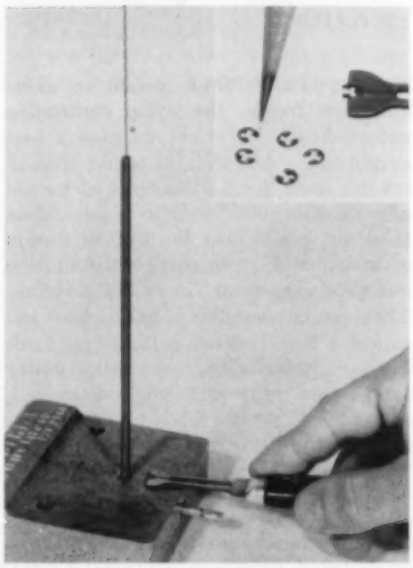


Industrial Notes

Propane-butane hose is being manufactured by Aeroquip Corporation for gas engines and other permanent applications. The body is reinforced with two heavy cotton braids and with a steel-wire braid which is brought in contact with the fitting to carry off static electricity. Designated as Type 1533, the hose is said to be impervious to all liquefied petroleum-gas products and can be flexed at −45°F without cracking.

Circle 2E on reply card

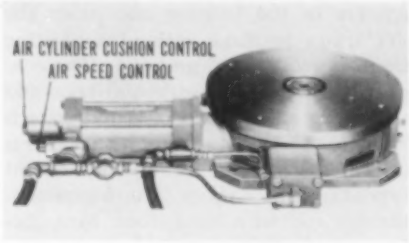
An open-type retaining ring for shafts 0.062 inch in diameter is the smallest device of this kind yet to be supplied by the Industrial Retaining Ring Company stacked on a metal rod for quick and easy assembly. The rod is part of



a dispenser with a special cast-iron base and application tool, which are supplied free with each initial order. According to the manufacturer, the rings, designated as No. 1000-6, can support heavy thrust loads and will withstand vibration without displacement. Applied radially, they are readily snapped into position, and a patented feature permits reuse without loss of resiliency. They replace other fasteners that require costly machining and longer assembly time, and are made of carbon-spring steel, beryllium copper and phosphor bronze. Other stacked open-type rings are available in sizes 5/32 inch to 1½ inches for shafts 1/16 to 1 inch in diameter.

Circle 3E on reply card

Adjustable air feed and cushioned stop to compensate for variations in load weights and diameters are features of a new and larger index table offered by Air-Hydraulics, Inc. The Model 1405 has a 15-inch-diameter table that can be mounted horizontally or vertically and is powered by a 3½-inch pneumatic cylinder using line pressure ranging from 60 to 175 psi. Standard equipment is furnished with a 4-, 6-, 8- or 12-station ring, and special types with up to 30 stops are made to order. According to the manufacturer, an 8-station ring with a 22-inch, 200-pound load has operated at the rate of 100 units per minute without backlash, skip or overrun.

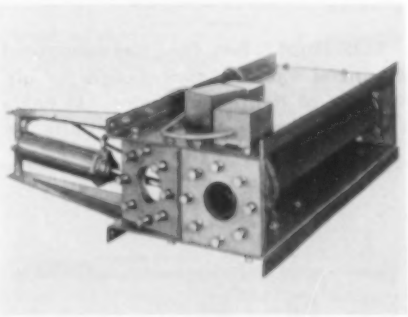


Circle 4E on reply card

For food-processing and other establishments where sanitary conditions must be maintained, West Disinfecting Company is prepared to lay out an insect control system that can be operated from a central station. Atomizers of a new design are used and located overhead at strategic points throughout a building. They are connected by piping with the plant's compressed-air or steam line and spread a penetrating insect-killing fog that is said to leave no residue and to be harmless to humans.

Circle 5E on reply card

A pneumatic pipe-line system for moving foundry sand has been announced by The Gerwin Industries, Inc. Named Whirl-Air-Flow, it has three main components—a transporter with a cone-shaped bottom, the pipe line, and transfer switches—and is installed as a com-



plete system to meet individual foundry requirements. The transporter is loaded with sand from the batch-mix muller and sealed by closing a top flap or gate. Then three inlet manifolds admit air by way of twelve renewable jets, which

DIG DEEP . . . LIFT . . . AND CARRY FAR

Tri-State Zinc Mine uses Sauerman Slackline Cableway for open pit mining.

Scraper bucket returning to pit where it is digging 200 cu. yds. per hour.

How Sauerman Machines Cut Costs

With one man at the controls, a Sauerman Scraper or Slackline Cableway can reach out 1,000 ft. or more and dig, haul and dump ore, sand, gravel or any bulk material. Simple operation! Manpower economy!

A Sauerman machine can be installed to reach across a pit, pond, river or stockpile, or up to the top of a hill. It moves material rapidly anywhere within its wide radius. Flexible for varied ground conditions. Costs only a few cents per cubic yard handled. Gas, electric or diesel. Scraper sizes: 1/3 to 15 cu. yds. Slack lines: 1/3 to 3½ cu. yds.

Write for Illustrated Catalogs

Sauerman Bros., Inc., 548 S. Clinton St., Chicago 7, Ill.

ONE MAN MATERIALS HANDLING

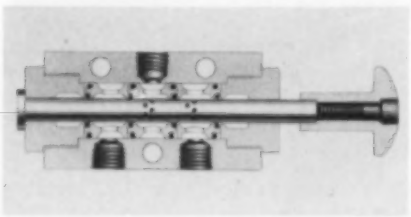
SAUERMAN BROS., INC.

Circle 14A on reply card

drive the sand in a smooth whirling flow from the outlet into 4-inch piping with interposed transfer switches which permit almost unlimited take-off points to hoppers in the core room or foundry. The transfer switch is operated by an air cylinder and positioning cams, with limiting switches for indicating direction of flow. The entire system is controlled by one man from a central push-button panel and, as it is completely enclosed, operates dustfree. Its capacity is determined by the size of the transporter, which is available in 7½-, 15- and 30-cubic-foot models.

Circle 6E on reply card

C.B. Hunt & Son, Inc., has announced a control valve of new design for air, vacuum or hydraulic service. It has a straight-through bore, gland nuts for



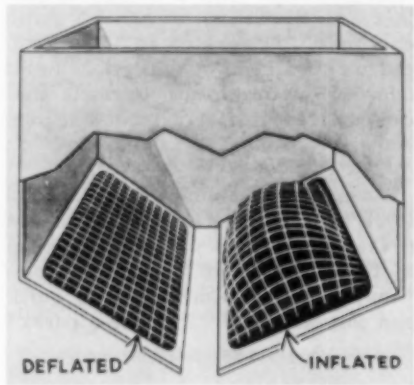
ends, a hollow radially ported stainless-steel plunger, internal spacers held firmly metal to metal and "O" rings of two sizes placed on the shoulders of the spacers and supported on both their inside and outside diameters. Tightening the gland nuts accurately positions the spacers in the housing and holds the "O" rings in place without subjecting them to mechanical pressure. The construction is said to minimize friction and wear. The new Quick-As-Wink series is available for pressures and temperatures up to 125 psi and 150°F, in different types tapped for ⅛- or ¼-inch pipe connection and with hand, foot, cam, diaphragm or other control.

Circle 7E on reply card

As the result of a research program started by Structural Clay Products Institute, that organization developed an insulated cavity wall that can be built without the difficulties usually encountered in masonry construction of this type. The insulation used is an easily pouring watertight compound that can be applied to the surfaces without furring, lathing or plastering.

Circle 8E on reply card

PneuBin, developed by Gerotor May Corporation, is an inflatable panel that is said to prevent bridging, funneling and caking of bulk materials as it is being fed from hoppers or bins. The panel consists of a rectangular steel plate which is bolted to the inside of a container and of a neoprene-rubber diaphragm permanently bonded at the edges to the plate. When not in use, the diaphragm lies flat against the plate; but when needed, it is made to pulsate at the rate of once every two or three minutes or eight or ten times a minute, depending on the size, by alternately admitting or exhausting compressed air.



The material is thus caused to move and flow freely, the cycle continuing automatically at a set frequency and amplitude. Air can be taken from a regular shop line and is reduced by aid of a throttle valve to 2 to 5 psi. More than one panel may be used in unison or in sequence from one control station and sizes vary from 3x6 to 24x72 inches. They can be installed in wood, steel and concrete bins and are suitable for feeding such materials as core and foundry sand, wood pulp and wood flour, pulverized coal with a high moisture content, and cork mixed with a binder, to name only a few.

Circle 9E on reply card

For the impregnation of porous metals or castings, American Metaseal Corporation is offering a packaged unit based on its vacuum-pressure system and using polyester resins. All the equipment is mounted on a steel platform and skids. There are two models occupying, respectively, 3x11 and 4x16 feet of floor space. Each is available with one or two impregnating tanks.

Circle 10E on reply card

In the Uintah Basin of eastern Utah is found a solidified form of petroleum that is excellent for insulating and protecting hot underground pipe lines against corrosion, according to the American Gilsonite Company which is marketing the material, specially sized, under the name of Gilsulate. Packed in bags, the stuff is poured right into the trench in which the pipe is laid and forms three layers around it. The first, in contact with the metal surface, melts and becomes a dense, semiplastic coat that lets the pipe expand and contract; the next is sintered or resolidified when tamped; and the outer layer remains unsolidified. Tests conducted by the Uni-

a Bigger, Better WISCONSIN
HEAVY-DUTY Air-Cooled
ENGINE
4-Cylinder, V-Type
Model VG4D
25 to 36 Horsepower

MORE Power TO FIT THE MACHINE

MORE Power TO FIT THE JOB

One of the outstanding performance characteristics of this fine engine is its exceptionally smooth running. Among other things, this is accomplished by means of accurately balanced weights, forged to the cheeks of the crankshaft, counter-balancing reciprocating forces in the connecting rods and pistons.

This engine is regularly furnished with Stellite exhaust valves and valve seat inserts, with positive type valve rotators — highly desirable for prolonging the life of valves and greatly reducing the frequency of valve servicing. Rotators cause a slow rotation of valve during time it is lifted off its seat by the camshaft, providing new positioning every time the valve seats, assuring uniform wear and retarding lead or carbon build-up.

For equipment requiring 25 to 36 hp., specify the Wisconsin Heavy-Duty AIR-COOLED Model VG4D. Detailed engineering data gladly supplied.

MOST H.P. HOURS

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

Circle 15A on reply card

versity of Utah and the Southwest Research Institute show that heat loss from pipes so protected is but 8 to 11 percent of that sustained by bare, buried lines. To make repairs or changes in such a line it is necessary only to remove the backfill and chip away the hardened Gilsulate.

Circle 11E on reply card

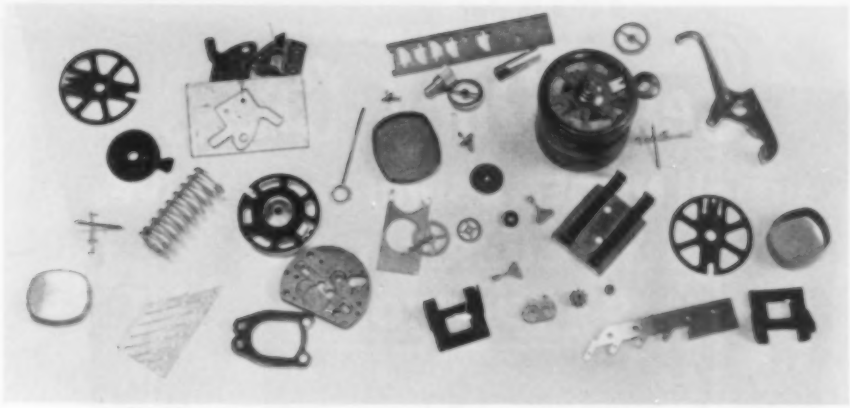
As a result of improvements which have not included changes in size or weight, SKF Industries, Inc., has greatly increased the bearing capacity and service life of its spherical roller bearings for heavy-duty application. The self-aligning feature has been retained, so that distortion or deflection of the shaft merely results in permissible misalignment of the inner race. The latter is of new design without undercuts or integral flanges. Longer rollers are used with more effective contact between rollers and rings, and a separate guide ring between the two rows of rollers allows them to take the position their contact

with the rings dictates. Load distribution is uniform at all times. Each row of rollers is held in a window-type cage that is made of cold-rolled brass of high tensile strength and centers on two large areas, one directly on the inner ring outside the rollers and the other on the outside diameter of the guide ring. The improved antifriction bearings are designated as the "C" Type and are available in Series 222 and 223.

Circle 12E on reply card

To facilitate the removal of cells from batteries for examination or repair, Gould National Batteries, Inc., has designed a simple device that is used in pairs. It is nothing more than a U-shaped steel loop brazed to a hexagonal nut with specially cut threads tapering from bottom to top. The nuts are screwed down over the lead posts, a strip of wood is inserted in the loops and the cell lifted out of the battery by any available overhead means. With hold-down clips, the tool may be used for taking the elements out of the jars.

Circle 13E on reply card



Chicago Wheel & Manufacturing Company is marketing a new precision barrel finishing chip which, the firm claims, will produce a fine finish to close tolerances. The material, called Novaculite, is of irregular conchoidal shape with sharp edges and elongated points that permit the use of larger chips which will reach hard-to-get-at indentations without clogging holes and changing the work. The material is said to have a mild honing, abrasive action that gives a smooth surface free from dents and burrs and does not damage stamped or cast parts. In the opinion of the manufacturer, the chips, because they do not charge the work with abrasives or extraneous materials such as iron oxides, are of advantage in finishing parts to be used in electronic assemblies or to be plated. Samples will be mailed upon request. The accompanying illustration shows products of intricate design and some of delicate construction that have been finished with Novaculite.

Circle 14E on reply card

Aluminum piping served two contractors to convey compressed air on stretches of the 88-mile West Virginia Turnpike, which involved the drilling and excavating of some 28 million cubic yards of earth and rock (see November, 1953, issue). A product of the Aluminum Corporation of America, it is 4 inches in diameter and comes in 20-foot sec-

Try WIEDEKE first
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IDEAL
TUBE EXPANDERS
INSET COLLAR Type Tube Expanders are available for Compressors, Condensers and other Heat-Transfer Units.
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Collar positions Tubes uniformly within Tube Sheet while Tube is being rolled.
See your Dealer or write us for Bulletin 850
THE GUSTAV WIEDEKE COMPANY
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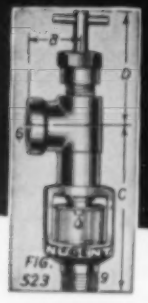
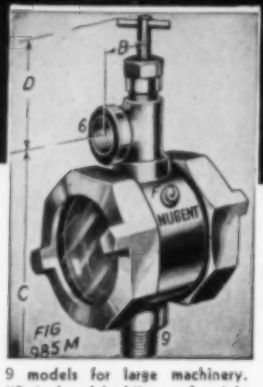
Circle 16A on reply card

See...Don't Guess

Install NUGENT Sight Feed Valves for LUBRICATION CONTROL



13 models designed for working pressures to 125 psi. Sizes to ¾ inch.

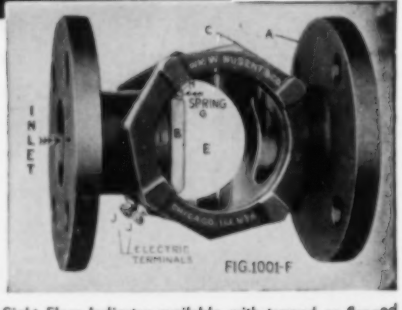


9 models for large machinery. "Swivel and lock" type for sight chamber adjustment to most convenient view position.

Medium size needle type with steel valve stem. 9 models. Sizes to ¾ inch.

WITH a Nugent Sight Feed Valve in your oil line, you can tell at a glance whether or not vital parts are receiving proper lubrication. Nothing is left to chance and there's no guess work involved. Oil flow through the valve is controllable from 2 drops per min. to 21 gals. per hour depending upon oil viscosity and valve model. All are vented to prevent air binding. Glasses and screens are removable for cleaning without interrupting oil flow.

SIGHT FLOW INDICATORS



Sight Flow Indicator available with tapped or flanged connections. Removable windows. Can be installed right or left hand or vertically.

ANOTHER NUGENT instrument for solving lubrication problems is the Sight Flow Indicator. Installed in a machinery oil system, this device sounds an alarm when oil is not getting to bearings. When oil is not flowing properly, Indicator "B" (See Fig. 1001-F) closes making contact with terminals "J". This sounds the alarm making it possible to locate trouble quickly, protect valuable machinery and save on costly down time.

For trouble free lubrication systems, write for descriptive bulletin on the Nugent Sight Feed, Sight Flow Indicator and other Lubrication Specialties.

Wm. W. Nugent & Co., Inc.

422 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

Established 1897

Circle 17A on reply card

tions, weighing 15 pounds each, linked by aluminum couplings. Because of its light weight, the pipe is easily handled and laid by one or two men even in mountainous areas. Groves, Lundin & Cox, Inc., used 1800 feet fed by three or four 600-cfm diesel-powered portable compressors, which maintained a line pressure of up to 130 psi to operate as many as six wagon drills simultaneously. The machines were coupled with threaded connections to a steel pipe which, in turn, was connected to the aluminum section with a new type of Wade coupling that can be made or broken in seconds, it is claimed, by inserting or removing a single pin. S. J. Groves & Sons Company had about 2000 feet of aluminum air line with bolted Morris sleeve-type couplings.

Circle 15E on reply card

New in principle and design, a 30-minute oxygen breathing apparatus weighing 8½ pounds with mask and shoulder holster has been introduced by the Cycle-Flo Company. It features a 5-minute escape cylinder that may be opened when the larger one is exhausted, thus making it unnecessary for the wearer to watch the pressure gauge. The unit may be refilled from any standard cylinder and delivers sufficient oxygen to permit its use as an industrial emergency inhalator. The same model with two 5-minute cylinders weighs 4 pounds.

Circle 16E on reply card

CLEANER SPRAY BOOTHS

Cleaner paint-spray booths are made possible, it is claimed, by a plastic material developed by Thompson & Company. Called Spray Booth Shield, and of pastelike consistency, it is applied to walls, turntables, etc., by brush, trowel or knife to a thickness of about 1/16 inch. It can be used alone and scraped off with a putty knife when it is desired to renew it, or paper can be applied over it and peeled off as illustrated prior to replacement. As no waiting or drying time is required, booths can be used immediately after the coating is applied.

Circle 17E on reply card

A new alloy, hollow drill steel that permits a wide latitude in heat treatment has been developed by Crucible Steel Company of America to meet specifications set by Ingersoll-Rand Company. Patented and designated as EEEE by Crucible, the steel is low in strategic alloying elements and is said to be easy to forge, to call for only a simple annealing process for good machinability and to be highly resistant to scaling. It is identified by a shallow groove that is rolled by I-R's patented roll marking method and extends the full length of one face on both hexagon and quarter-octagon sections. But the new product does not have to be segregated from other alloy drill steel where that is now in service because heat treatment is the same in both cases. A limited supply is available either from Ingersoll-Rand or Crucible Steel Company.

Circle 18E on reply card

A voice-powered telephone has been designed by The Wheeler Insulated Wire Company, a subsidiary of The Sperry Corporation, for use where a regular communication system of this type is unavailable or in isolated areas where one is temporarily needed. The instrument, which will transmit messages a maximum of 20 miles, operates on electricity generated by a Duranickel vibrating reed which is set in motion by the speaker through the medium of a diaphragm in the mouthpiece.

Circle 19E on reply card

QUOTES

—FROM HERE AND THERE

Air-Minded Mines

". . . if you work at a mine which does not use compressed air . . . you may wake up tomorrow morning to find pneumatic equipment right in your lap, because roof-bolting, face preparation, shop-tool operation, overburden drilling and other mining jobs are more and more becoming applications where compressed air shows up to advantage. Furthermore, it wouldn't surprise us to see the old charging tank in new dress come back into the coal mines for powering certain shuttle-type transportation units. Nowadays you could put one of the new portable compressors right alongside such a tank to eliminate long air lines, and you'd have a dandy little unit for changing cars behind a rock-loading machine, for example." *Coal Age, July 1953*

Matches Bring Fine

"When Charles Whitfield, miner, of Cheviot Road, Winlaton, Durham, was fined £5 at Gateshead for having cigarettes in a safety lamp mine, and £5 for having matches in the mine, the solicitor

VICTAULIC
METHOD OF PIPING

FOR GROOVED PIPE

Style 77 & 77-D

Style 78
VICTAULIC SNAP-JOINT

New, boltless coupling — hand-locks — for faster hook-ups with no loose parts. Ideal for temporary or permanent lines. Sizes 1", 1¼", 2", 3", 4".

VICTAULIC COUPLINGS Style 75

Style 77 & 77-D—The "general-purpose" couplings for standard applications. Simple, fast, reliable—sizes ¾" to 60".

Style 75—Light Weight Couplings—for low pressure, low external stress applications. Sizes 2", 3", 4".

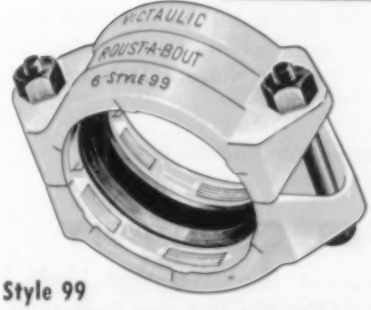
VIC-GROOVER TOOLS

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle, operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

VICTAULIC FULL-FLOW FITTINGS

Streamlined for top efficiency, easy to install—complete line, Elbows, Tees, Reducers, Laterals, etc., — fit all Victaulic Couplings. Sizes ¾" to 12".

FOR PLAIN END PIPE



Style 99
VICTAULIC ROUST-A-BOUT COUPLINGS Best engineered, most useful plain end joint on the market! Simple, fast, husky. Easy to install with any socket wrench. Takes strong, positive, bull-dog grip on pipe. Sizes 2" to 8".

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog and Engineering Manual No. 54-8B

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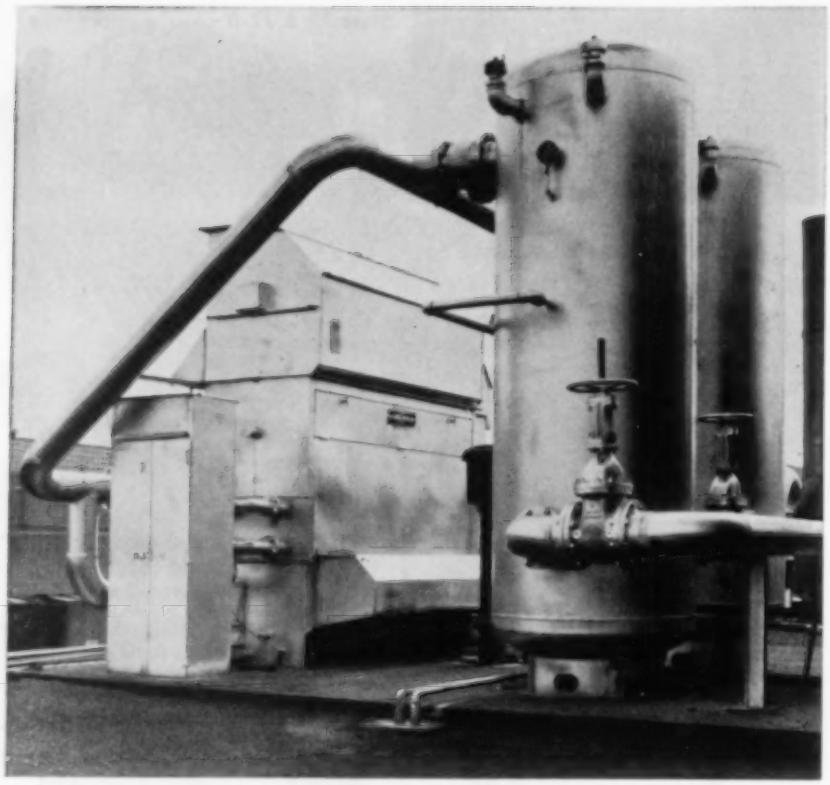

HOW YOU SAVE,
Getting Drier Compressed Air

● Direct saving in the cost of cooling water saves the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, the drier air gives you a better operation and lower costs in the use of all air-operated tools and machines, paint spraying, sand blasting or moisture-free air cleaning. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara Aero After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter by the Niagara Balanced Wet Bulb Control.

Write for complete information; ask for Bulletin No. 98

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Niagara District Engineers in Principal Cities of U. S. and Canada

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

Circle 19A on reply card

for the prosecution, Mr. W. Kinghorn, said that a tin containing nine cigarettes and 15 matches was found hidden in a tin of explosive. Whitfield pleaded guilty. It was a gaseous district and Whitfield had endangered the lives of all the men in it. Whitfield had previously been fined for a similar offence."

Iron & Coal Trades Review, London, September 25, 1953

Important

"Compressed air is a plant facility second in importance only to power and water as a necessary part of modern industrial operations. When air compressors are combined with gas and refrigeration units, they represent plant equipment equalled in magnitude only by a few types of industrial machines."

Industry & Power, January, 1954

A British View

"One of the leading factors governing design in American engineering, according to a team of eleven British specialists who visited nearly 50 establishments in the United States, is 'producibility.' The need for considering economy when deciding upon design is also emphasized in the team's report. . . . Cooperation between design and production departments in the U. S. was repeatedly apparent. . . and this is one of the two factors quoted as responsible for the industrial success of the U. S. The other is the technical rivalry which operates vigorously between individuals, between departments and between firms.

"Coupled with the drive for simplification, says the report, is that toward standardization, which is not thought to stifle progress provided that the preparation of the standards is frequently reviewed. One general principle is that the quality of an article should be equal to its purpose, but not superior to it. This attitude is epitomized by the remark: 'We don't paint the underside.' "

Iron & Coal Trades Review, London, October 16, 1953

Engineering Education

EDITOR:

Your editorial *Engineering Education* in the December, 1953, issue was thought provoking and informative. May I take the liberty of adding a personal comment?

One point frequently overlooked in discussing engineering education is that it is more than the job of developing an adequate curriculum. Actually, there are three elements which must be integrated into an over-all program:

1. The curriculum
2. The environment
3. The college faculty

The curriculum can be charted much as a football coach charts his plays. There is an objective to be reached and

certain assignments must be carried out. The degree to which liberal arts, science, and engineering courses are required varies widely with the objective of the curriculum. Obviously a research and a maintenance engineer represent entirely different types of curricula.

The environment can vary widely from cap and gowns to overalls and oil cans. It can vary from an autocratic faculty dictating to the students to a completely privileged student body dictating to the faculty.

The college faculty can vary from highly theoretical scientists to practical operating and service engineers; from extroverts to introverts; from "good eggs" to grouches.

The point to be made is that the three elements must be geared together if the total educational job is to be accomplished. Students must live, learn, and labor in an integrated pattern—they do not live at one end of the campus and learn and labor at the other end. The three are basically inseparable. A liberal arts course, *per se*, will not teach a student how to live any more than a course in vector analysis will teach him to design. The student must be given a chance to apply his liberal arts learning to living and work situations just as he must apply the vector analysis to practical design situations. His curriculum, his environment, his faculty contacts must be molded into a practical, "real-life" atmosphere.

Few people, after college, live in an exclusively liberal arts atmosphere. Few people, after college, live in an exclusively engineering atmosphere. Rather, they live in a community atmosphere which is a combination of liberal arts, engineering, and many other elements. This is why there is no panacea, no one "right way" to produce a well rounded engineer. We need attention to what the curriculum contains but we need as much attention to what the student does and whom he meets inside and outside of class.

HAROLD P. HAYES
Dean of Engineering
California State Polytechnic College
San Luis Obispo

Admires Cards

EDITOR:

I've been reading in your issue of December, 1953, a very interesting article about Yuletide greetings. I should like very much to get some cards with the beautiful legends of the Christmas rose and candles, but I don't know the address of the firm, Rust Craft Publishers. I will be very thankful if you will be so kind (as) to help me.

INA MEYER
42 Skelbakgade,
Copenhagen V, Denmark

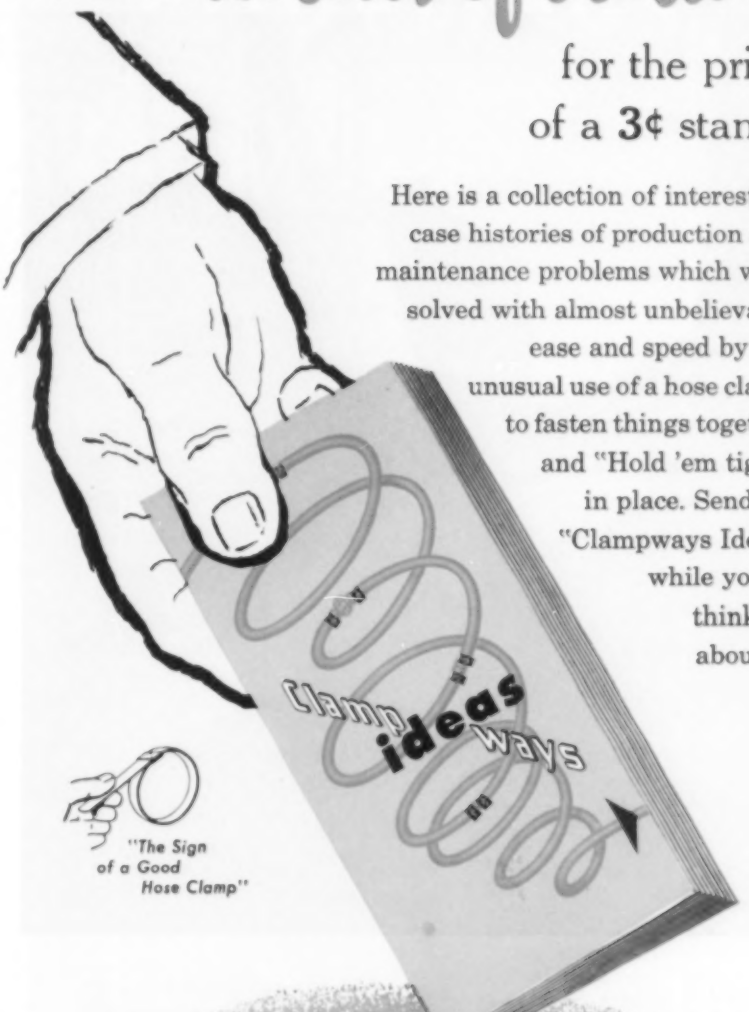
EDITOR'S NOTE—We have arranged with Rust Craft of Boston to send Mrs. Meyer some of the legend cards.

ideas...worth

hundreds of dollars

for the price of a 3¢ stamp

Here is a collection of interesting case histories of production and maintenance problems which were solved with almost unbelievable ease and speed by the unusual use of a hose clamp to fasten things together and "Hold 'em tight" in place. Send for "Clampways Ideas" while you're thinking about it.*



"The Sign of a Good Hose Clamp"

PUNCH-LOK Company

*...or get your copy from your near-by Punch-Lok Distributor.

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THE SHOW MUST GO ON

Its ability to take it and carry on has established Naylor light-weight pipe as a star performer in mining service. The extra collapse strength provided by Naylor's exclusive lockseam-spiralwelded structure plus ease of handling and installation have earned top billing for Naylor in high and low pressure air and water service. If this is the kind of performance you need, write for Naylor Bulletin No. 507 to get the complete story.

NAYLOR PIPE

Naylor Pipe Company • 1245 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Circle 21A on reply card

Books and Industrial Literature

Construction Methods and Machinery by Prof. F.H. Kellogg, Dean of Engineering, University of Mississippi, is the latest addition to the Prentice-Hall Civil Engineering and Engineering Mechanics Series and meets the need in the construction industry of a book that will be of aid to students, building contractors and architects, as well as civil engineers. In the 415-page illustrated volume, the author ties together the fundamentals in a civil-engineering curriculum and gives a quantitative presentation of their applications to the nation's second largest industry. The first chapter gives a general view of construction organization and planning, and this is followed by economics and statistics to fit planning, estimating, selection of equipment and cost control; interpretation of manufacturers' specifications in determining power requirements; and a discussion of transportation, hoisting, conveying and pumping equipment. Then, with the aid of flow charts and statistics, specific operations are dealt with in the order in which they are normally scheduled on a project. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N.Y. Price, $10.00.

On the occasion of moving into a new plant after 55 years of corporate existence, The France Packing Company has issued a free booklet that traces the firm's history and gives a good glimpse of its current activities. The historical section is liberally illustrated with humorous old-style drawings depicting typical manufacturing operations and featuring caricatures of staff members and employees. The France Company is a leading supplier of packing for air- and gas-compressor cylinders. The booklet is recommended as interesting industrial reading.

Circle 20E on reply card

Bulletin No. 201, copyrighted by The V. D. Anderson Company, features graphs that will enable users of the firm's Hi-eF purifiers to select the size required for a given job.

Circle 21E on reply card

An illustrated 4-page folder on Amcoweld asbestos and heat-resistant chrome-leather garments for the protection of welders has been released by Eastern Equipment Company, Inc.

Circle 22E on reply card

Staynew automatic filters designed for large air volume and high efficiency are described in a 12-page illustrated bulletin—No. 500—obtainable from the Dollinger Corporation.

Circle 23E on reply card

A 4-page folder dealing with its line of precision-made power-transmission equipment has been issued by T. B. Wood's Sons Company for purchasing agents and design and plant engineers.

Circle 24E on reply card

Complete physical specifications of eight industrial cleaning solvents are shown on consolidated data Chart CD offered by the John B. Moore Corporation, producers of solvents engineered for safety.

Circle 25E on reply card

General Electric Company has announced its 1954 instrument transformer buyer's guide which is designed to save time in selecting any standard product in this field. Ratings, ASA accuracy classifications and

other pertinent data on all its indoor and outdoor potential and current transformers are contained in the 96-page illustrated publication (GEA-4626G), which also includes tables covering the mechanical and thermal limits of current transformers.

Circle 26E on reply card

An illustrated bulletin published by F. W. Dwyer Manufacturing Company describes each of its industrial precision instruments and gauges for measuring combustion, draft, pressure, flow, vacuum, carbon dioxide, smoke, velocity, temperature, etc.

Circle 27E on reply card

Operation, applications and specifications of electrostatic voltmeters and peak-voltage adapters made by Sensitive Research Instrument Corporation are covered in Vol. 20 of *Electrical Measurements* published by the company. Reprints are available.

Circle 28E on reply card

Two booklets on its corrosion-resistant valves are obtainable from Associated Valve & Engineering Company. Section A deals with needle valves and Section E with safety and relief valves. Construction details and dimensions are given, as well as capacity tables.

Circle 29E on reply card

Catalogue No. 109, recently published by The Cleveland Vibrator Company, describes and illustrates its pneumatic vibrators of the metal-impact and air cushioned types. The line includes fourteen piston-diameter sizes and 29 mountings.

Circle 30E on reply card

As a practical help to pipe users, Naylor Pipe Company has issued Bulletin No. 507 showing typical applications of its lightweight lockseam-spiralweld pipe and fittings. Included are standard specifications on pipe from 4 to 30 inches in diameter, as well as data on fabricated fittings, flanges, and connections to meet all pipe-line requirements.

Circle 31E on reply card

What is claimed to be the most complete industrial spray-nozzle catalogue ever published has been announced by Spraying Systems Company. Thousands of standard and special industrial nozzles are illustrated and described in its 48 pages and the capacity and spray angle of each are listed. Catalogue No. 24 also contains information on related equipment and tables on spray coverage and pipe friction.

Circle 32E on reply card

A profusely illustrated handbook has been released by The B. F. Goodrich Company on its Plylock joint for splicing rubber transmission belts. Of 32 pages, it gives splicing instructions, lists the tools and materials required, and tells how to assemble the splice on the drive. Also included is a series of tables for figuring endless belt lengths and the time required to vulcanize belting of varying types and thicknesses.

Circle 33E on reply card

The ABC of Large A-C Motor Control is the title of a 36-page booklet that presents basic facts helpful in selecting and applying the proper controls for large industrial motors. It was written by specialists of Electric Machinery Manufacturing Company and contains more than 60 illustrations and charts which are fully discussed in the text, as well as information on the latest developments in protective features for motors and operators.

Circle 34E on reply card

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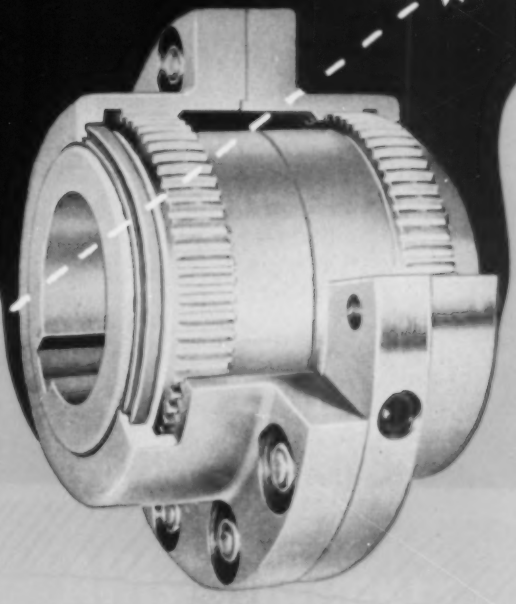
built for long life

COUPLINGS



preferred for their 7 DESIGN FEATURES

1 **ALL STEEL** construction from high grade steel forgings with fine tool finished surfaces.

2 **ONE PIECE COVER SLEEVE** is one solid forged steel unit for added safety at high speeds.

3 **AUTOMATIC LUBRICATION** with ever-present oil film between hub and sleeve to prevent friction or wear.

4 **POSITIVE SEAL** hermetically seals coupling against oil oxidation and keeps ample supply of CLEAN oil inside.

5 **LONGER LINING UP SURFACE** insures easy, accurate initial alignment and full capacity to handle any subsequent misalignments.

6 **COVER SLEEVE BEARING** prevents any added pressure to either shaft; eliminates adverse end crank action on shaft.

7 **LARGER BORE** permits use of smaller physical capacity for same size shaft and reduces rotating weight.

WALDRON couplings are available in sizes up to 18" shaft diameter. We specialize in furnishing couplings for unusual applications and services. We would be pleased to send you our latest bulletin 55C upon request.

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Since 1827

Sales Representatives In Principal Cities

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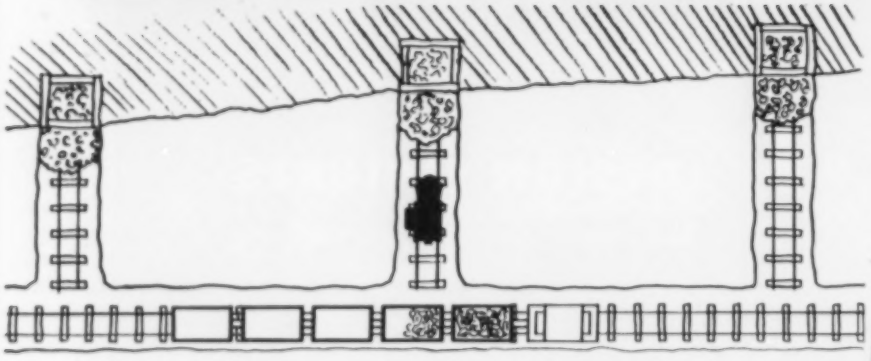
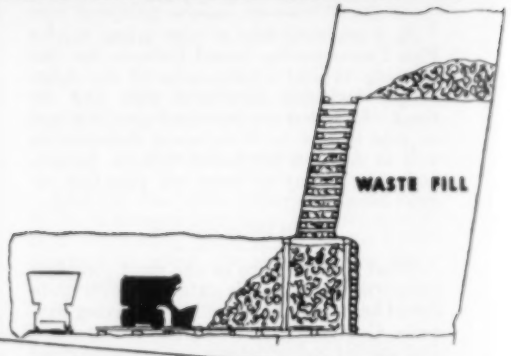
INVESTIGATE THE ADVANTAGES OF LOADING WITH EIMCOS





The photo above and diagrams illustrate a highly successful, low cost operation. This is one of the Model 21 Eimcos handling production loading from drawpoints in a large iron ore mine.

This is further proof that this method of mining is safer, better and cheaper than the old method of chutes, grizzlies, scrapers, etc.

Write for more information to The Eimco Corporation, P. O. Box 300, Salt Lake City, Utah, U. S. A.

THE EIMCO 105
WORLD'S FINEST TRACTOR-EXCAVATOR

When your project requires a large producing piece of equipment as a prime mover, bulldozer, loader, excavator, let us tell you about the 105.

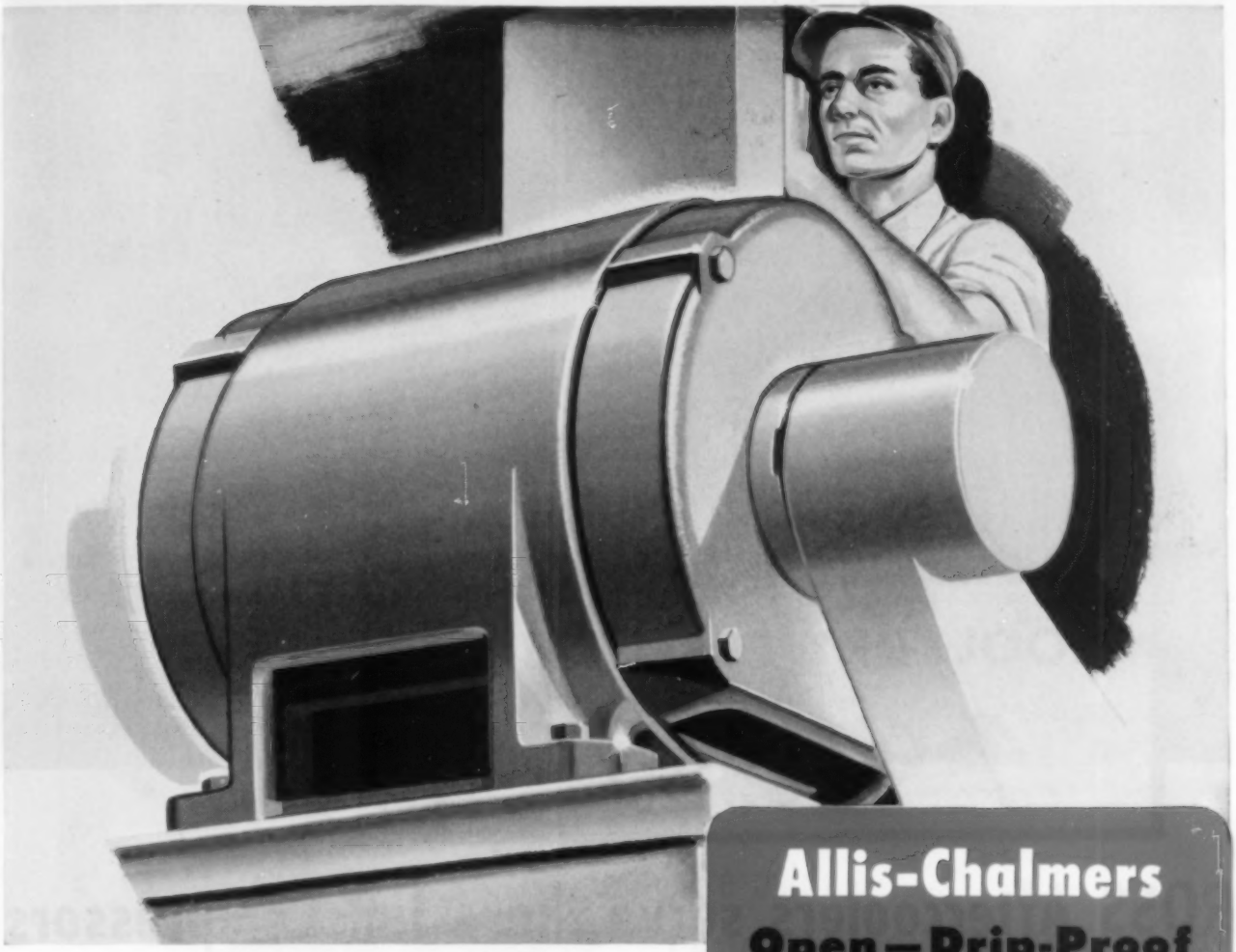
Loading capacity in rock about 5 yards per minute, in sand and gravel about 7½ yards per minute.

This is a really heavy-duty machine, all steel construction with greater maneuverability and longer life.

B-20

THE EIMCO CORPORATION
Salt Lake City, Utah, U.S.A.
Export Office: Eimco Bldg., 52 South St., New York City

You can't beat an Eimco!



Allis-Chalmers Open—Drip-Proof MOTORS

Greater Protection Against Foreign Matter
Long-Life Bearings
Many Tried and Proven Features

new motors new values

Here are a few of the reasons why the new Allis-Chalmers open—drip-proof motor in NEMA rerate sizes gives you better performance and lower maintenance costs in general-purpose applications.

- *Better protection against falling water and debris because cooling air inlets are on bottom.*
- *Long bearing life because large grease chambers provide plenty of reserve lubricant and are thoroughly sealed against foreign matter.*
- *Quieter operation, smoother performance.*

GET COMPLETE INFORMATION NOW

Allis-Chalmers, Milwaukee 1, Wis.

Send for these bulletins:

- ☐ Open — Drip-Proof, Type G, 5186210
- ☐ TEFC, Type GZ, 5187225
- ☐ Explosion-Proof, Type GZZ, 5187286

Name.....

Company.....

Position.....

Address.....

City and State.....

A-4281

ALLIS-CHALMERS

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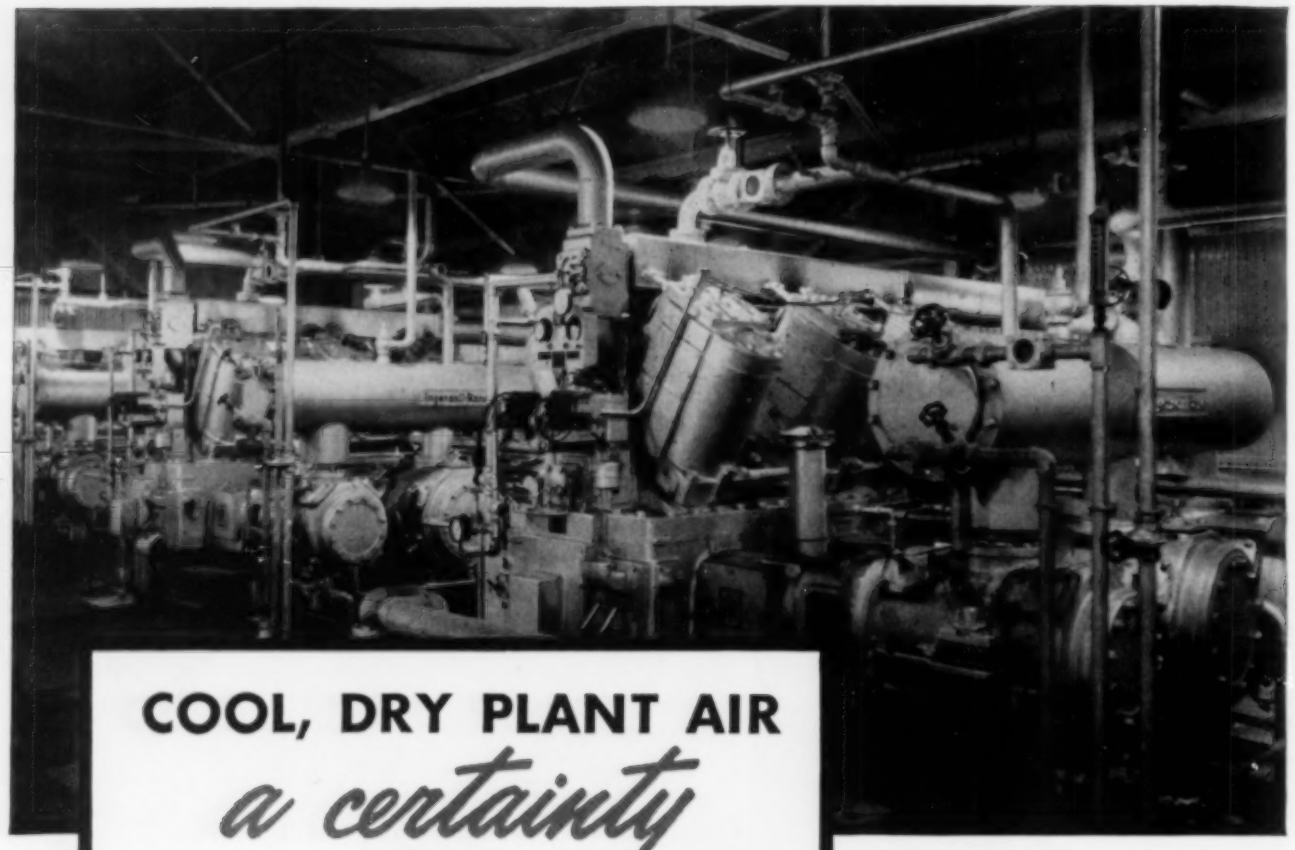
Circle 24A on reply card



COOL, DRY PLANT AIR *a certainty*

ROSS Aftercoolers serve these I-R Compressors

On the job, but out of sight, in this Ingersoll-Rand air compressor installation at the Reynolds Metals Company Aluminum Reduction Plant, Gregory, Texas, are three Ross Aftercoolers . . . one for each of the 6SVG gas engine driven units supplying plant air.

In dozens upon dozens of other Ingersoll-Rand compressor installations . . . not only in industrial plants, but in numerous chemical plants, refineries and pipeline stations . . . you'll find the same team. Ross Aftercoolers are frequently the choice to work with I-R Compressors . . . just as they are the choice of other highly rated compressor manufacturers.

There are many solid reasons. Among them: (1) *Ruggedness*—the ability to "take-it" under all conditions. (2) *Thermal Efficiency*—unsurpassed by any other heat exchanger design. (3) *Standardization*—assuring prompt availability and economical manufacture. (4) *Engineering Cooperation*—Kewanee-Ross representatives have a reputation for helpful consultation and practical recommendations.

The design and structural advantages of Ross Aftercoolers, Cylinder Mounted Intercoolers, and Lube Oil Coolers have won the preference of compressor builders and users everywhere. Descriptive literature will be mailed to you, so that *you* can evaluate these advantages for yourself. Write.

AFTERCOOLERS

INTERCOOLERS

LUBE OIL COOLERS

ROSS

KEWANEE-ROSS CORPORATION

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

1471 WEST AVENUE • BUFFALO 13, N. Y.

In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

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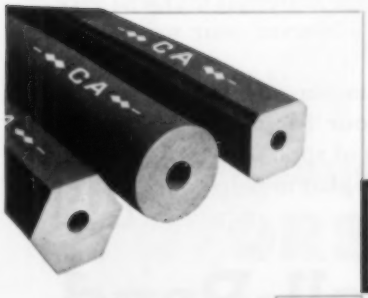
they're using

CRUCIBLE HOLLOW DRILL RODS at FOLSOM DAM

THE FOLSOM DAM project is a big construction job. When completed it will be 340 feet high, 1400 feet long – with wing embankments extending for more than two miles. The new dam will provide a source for irrigation and power, and serve to control flood conditions in the American River Basin near Sacramento, California.

Part of the construction work involves the excavation of more than 9 million cubic yards of earth and rock. Here's where Crucible Hollow Drill Rods are playing a mighty important role. They can't be beat when it comes to hard rock drilling operations.

Crucible Hollow Drill Rods are made to tool steel standards by the world's largest producer of tool and other special purpose steels. This *extra* quality assures you of minimum rod breakage . . . and fewer valuable bit losses. For dependability in rock drilling, buy Crucible Hollow Drill Rods.



CRUCIBLE first name in special purpose steels

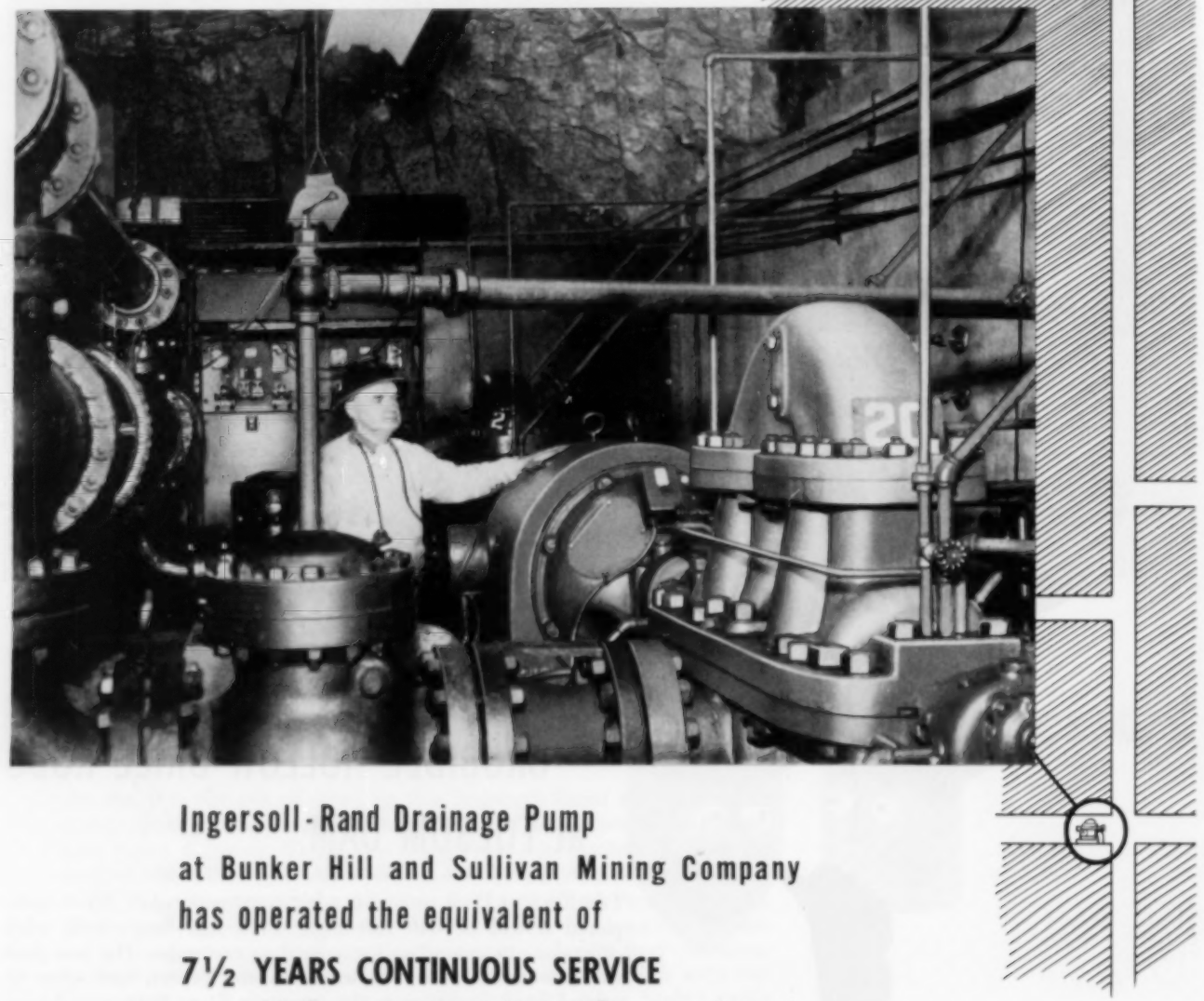
54 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

67,420 HOURS at 1600 feet down



Ingersoll-Rand Drainage Pump
at Bunker Hill and Sullivan Mining Company
has operated the equivalent of
7½ YEARS CONTINUOUS SERVICE
... without opening the casing!

The Ingersoll-Rand pump shown above was installed in 1943, on No. 17 level of the Bunker Hill and Sullivan Mining Company, Kellogg, Idaho. Since then, this six-stage, Class RTS unit has been pumping 820 gpm of drainage water at 1750 ft. head for a total of 67,420 hours – and some 3 billion gallons. The only maintenance so far has been periodic repacking. And the casing has never been opened.

Successful performance like this stems from Ingersoll-Rand's years of experience in the design, construction and application of mine pumps for both centralized and de-centralized drainage systems. Through this experience, I-R engineers can select the materials that will give long pump service, whatever your water conditions.

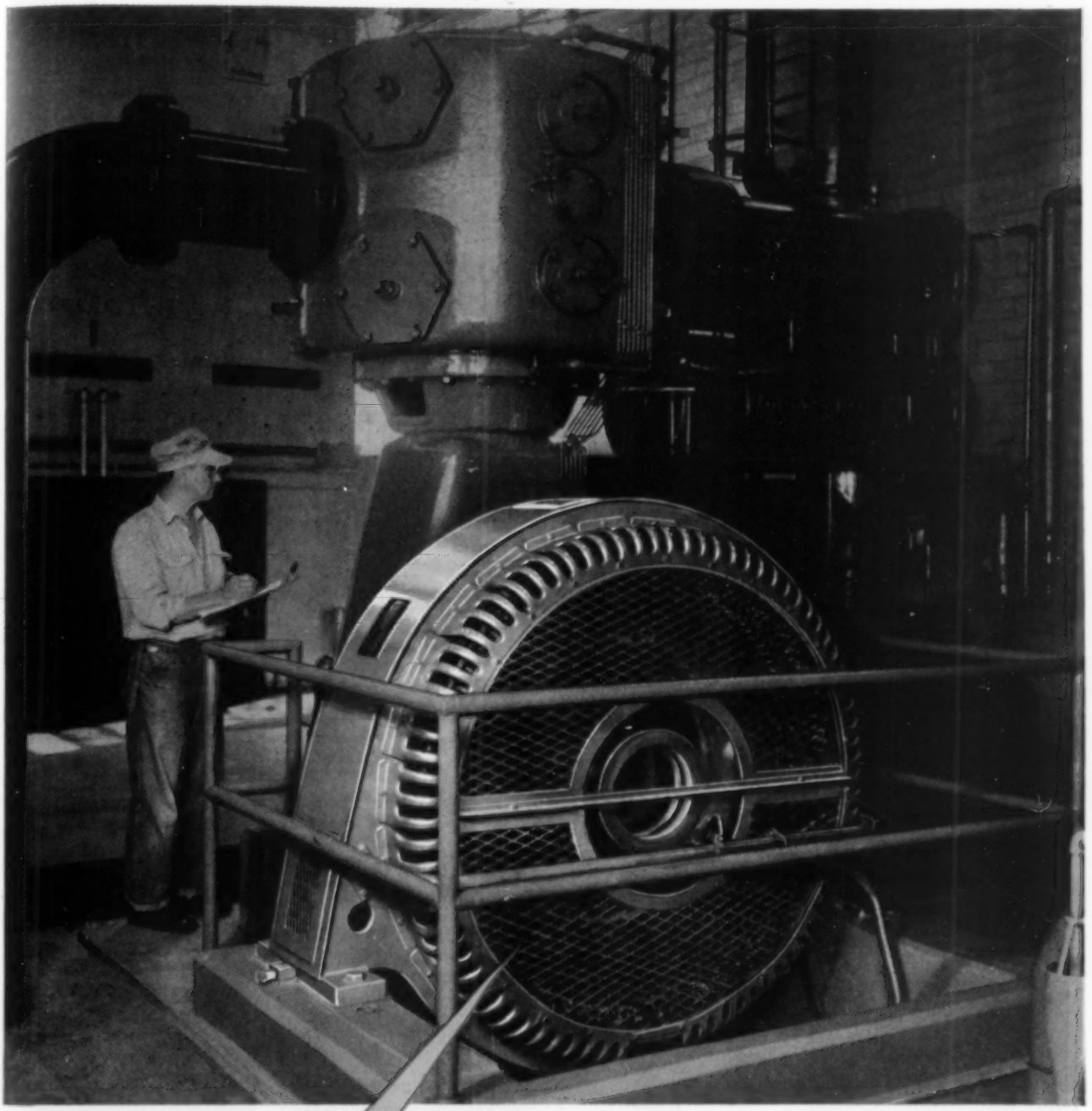
If you have a pumping problem, why not talk it over with your I-R representative. He's had lots of specialized experience and will be glad to help you.

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

959-10

COMPRESSORS • GAS & DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR & ELECTRIC TOOLS

Circle 27A on reply card



They're tops on compressor drives

ELLIOTT synchronous MOTORS

THE PICTURE SHOWS an Elliott 450-hp, 327-rpm synchronous motor driving an Ingersoll-Rand air compressor in a Detroit area auto plant.

Elliott synchronous motors can be supplied for any type of reciprocating compressor. They are "custom-built" for the compressors they drive, with quality performance and low maintenance insured by such refinements as mica ground insulation at 2300 volts or higher, lugs on the sole-plate to permit horizontal adjustment of air gap, and holes provided for lifting the stator.

For full data, phone your local Elliott representative or write Elliott Company, Ridgway, Pa.

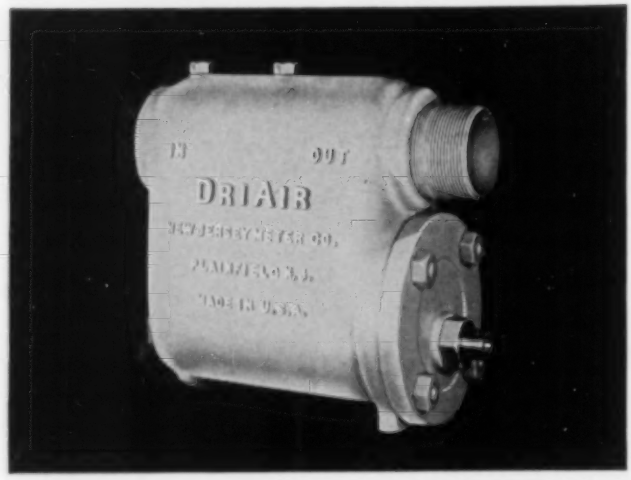
Elliott FABRI-STEEL MOTORS AND GENERATORS

R3-14

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

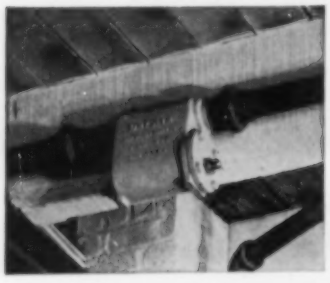
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

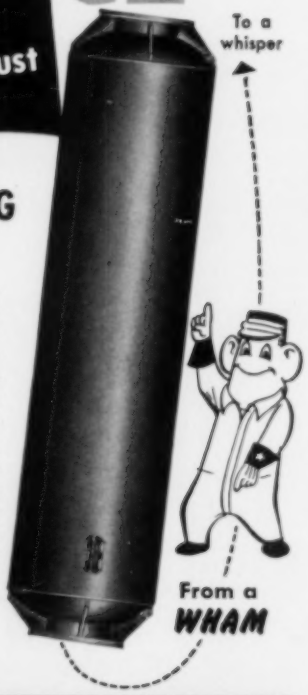
Circle 29A on reply card

SILENCE

Those Costly Intake and Exhaust NOISES

with

BURGESS-MANNING SNUBBERS



They signal inefficient performance of your equipment and may cost you thousands of dollars annually in errors through faulty oral communications, needless nerve strain and fatigue, and result in poor neighbor relations.

Install Burgess-Manning Snubbers to scientifically silence exhaust noises from diesels, gas engines, jets, turbines, steam discharges, vacuum pumps and compressors. They offer plus values of air cleaning, heat recovery, spark arresting, surge control and water separating where required.

We invite you to submit your problems for recommendations —no obligation.

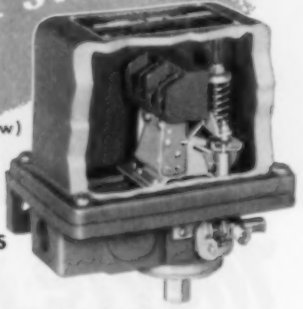
BURGESS-MANNING COMPANY

757 East Park Avenue — Libertyville, Illinois

Circle 30A on reply card

New! EXPLOSION-RESISTING PRESSURE SWITCH

(cutaway view)



FOR AIR COMPRESSORS AND PUMPS USED IN HAZARDOUS LOCATIONS

THESE FEATURES ADD UP TO A BETTER SWITCH:

- 200 lb. range and usual differential for air compressors and pumps
- Tamper-proof adjustment
- "Power-house" over-center spring fixed for positive action regardless of switch adjustment
- Externally mounted release valve protects against corrosion of internal parts

Also available in WATER-TIGHT construction

Write for Bulletin 9013-G.

Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

SQUARE D COMPANY

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Leaking Air
is an expensive luxury

If you can't afford it,

HILLS-McCANNA
Saunders Patent
diaphragm valves
will put an end to it!

WRITE FOR LITERATURE

HILLS-McCANNA
Saunders Patent
diaphragm valves
HILLS-McCANNA COMPANY, 2361 Nelson Ave., Chicago 18, Ill.

Circle 32A on reply card

CUT Cooling Water Consumption 50% —increase compressor efficiency

Schramm water-cooled, stationary air compressors, as shown, are equipped with Sarco rigid stem cooling controls, type TR-44R, as a recommended accessory.

These controls cut the water consumption to what is actually needed to protect the compressor.

They prevent impaired lubrication, often the result of overcooling. They are installed directly in the water piping, take up no extra space—require no attention. A Sarco strainer is installed ahead of the control valve.

Write for Technical Bulletin No. 5 to *Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.* *Advt. 614*

Circle 33A on reply card

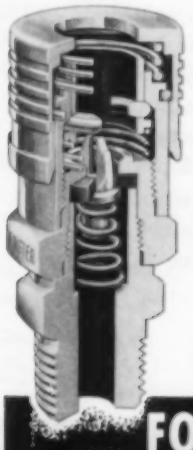
AMAZING NEW COUPLER FOR RECIPROCATING AIR TOOLS

Can't Be Hammered To Pieces!

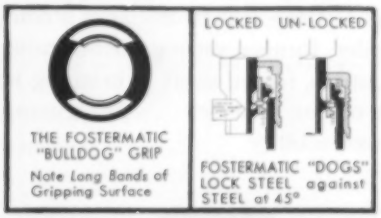
• No Pulling • No Twisting
• No Turning • No Screwing
—JUST PLUG IT IN

FOSTER *Matic*
QUICK DETACHABLE COUPLERS

- Can Be Used Directly With Reciprocating Air Tools Without The Use Of Lead Hoses
- Will Not Fall Apart Will Not Blow Apart
- Steel Body and Sleeve From Solid Bar Stock
- Greater Air Capacity—Small Diameter—Light Weight



Holds tighter without leakage, yet swivels freely, "Dogs" lock—STEEL against STEEL at 45°, and are positioned by floating steel carrier. Eliminates all usual housing wear. Write for NEW descriptive literature FM-14


LOCKED
UN-LOCKED
THE FOSTERMATIC "BULLDOG" GRIP
Note Long Bands of Gripping Surface
FOSTERMATIC "DOGS" LOCK STEEL against STEEL at 45°

"WE HAVE GOOD CONNECTIONS"

FOSTER MFG. CO. Inc.
2850 GRAVOIS • ST. LOUIS 18, MO.

Circle 34A on reply card

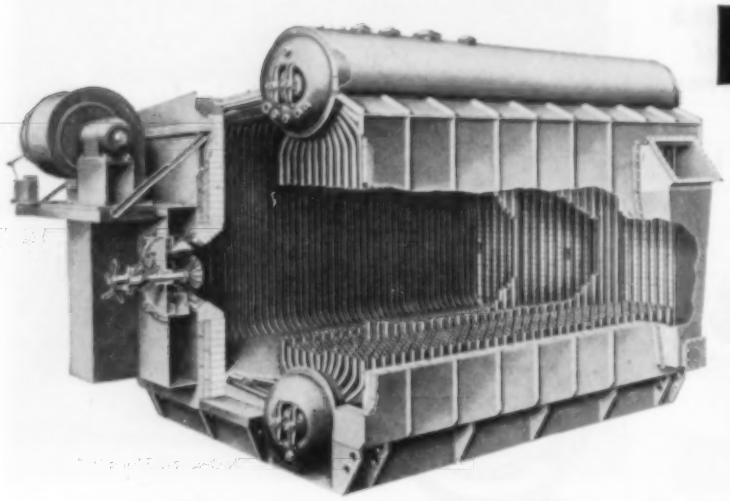
FOR STEAM CAPACITY up to 60,000 POUNDS

Choose your boiler from these two

If you burn oil or gas, investigate the VP Package Boiler for capacities up to 30,000 pounds per hr . . . the VU-10 up to 60,000 pounds.

For stoker firing, the VU-10 is available from 10,000 to 60,000 pounds of steam per hour.

Whatever your fuel . . . whatever your steam capacity requirements up to 60,000 pounds per hour — you'll find that one of the Combustion Engineering Boilers described below will be just right for you.



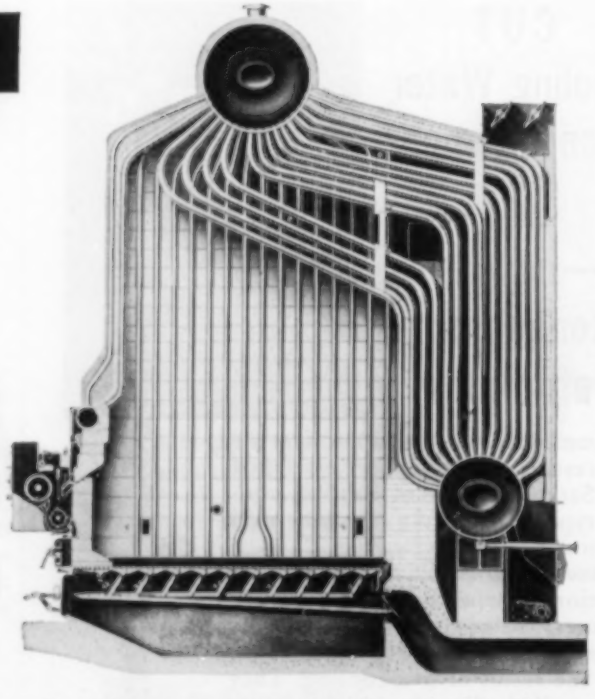
The VP Boiler — the Package Boiler with EXTRA Features

THE VP BOILER

The C-E Package Boiler, type VP . . . completely shop-assembled . . . for oil or gas firing. It is available in capacities from 4,000 to 30,000 lb steam per hr; for pressures to 250 psi. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large (30-in. diameter) lower drum permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. The centrifugal fan is efficient, yet its noise level is less than half that of typical high-speed blowers used on most package boilers. Baffle arrangement is simple, resulting in low draft loss . . . simple soot blowing . . . elimination of dead pockets . . . high heat absorption.

THE VU-10 BOILER

The VU-10 Boiler is designed for industrial load conditions, particularly for plants with small operating and maintenance forces. Capacities range from 10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . heat recovery equipment is available if desired. Fuel can be either coal (C-E Spreader, Traveling Grate or Underfeed Stoker) oil or gas. This boiler is a completely standarized design adaptable to many conditions. It responds readily to variations in load; it is simple to operate and maintain. All parts are easily accessible for inspection. Like the VP, the VU-10 Boiler is a complete unit — boiler, furnace setting, fuel-burning equipment, controls, forced draft — bringing you the benefit of one contract . . . one guarantee . . . one responsibility.



The VU-10 Boiler, as arranged for C-E Spreader Stoker firing

C-E

COMBUSTION ENGINEERING, *Inc.*

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

B-689B

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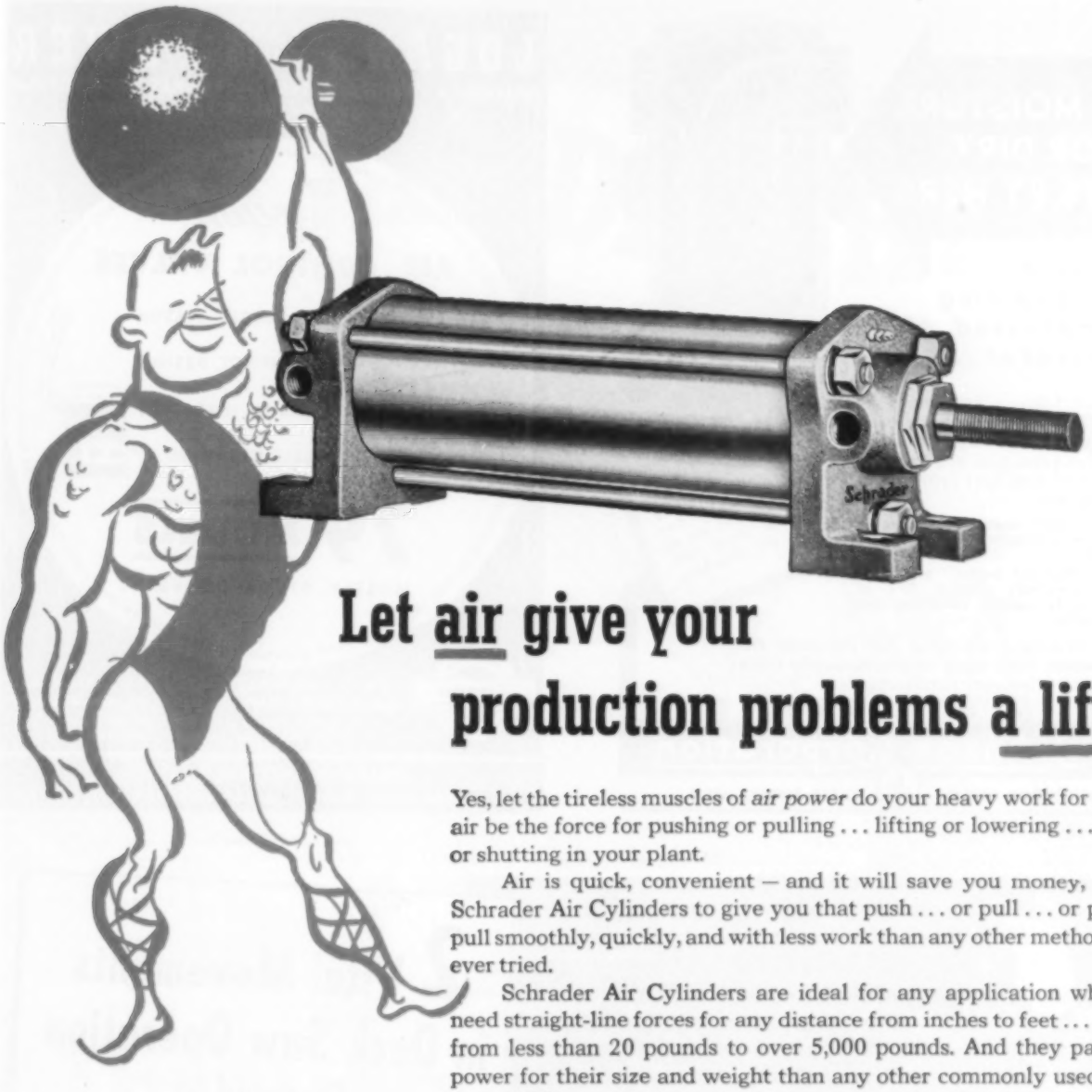

Let air give your production problems a lift

Yes, let the tireless muscles of *air power* do your heavy work for you--let air be the force for pushing or pulling . . . lifting or lowering . . . opening or shutting in your plant.

Air is quick, convenient — and it will save you money, too. Try Schrader Air Cylinders to give you that push . . . or pull . . . or push *and* pull smoothly, quickly, and with less work than any other method you've ever tried.

Schrader Air Cylinders are ideal for any application where you need straight-line forces for any distance from inches to feet . . . at forces from less than 20 pounds to over 5,000 pounds. And they pack more power for their size and weight than any other commonly used type of power unit.

So—wherever you need a hefty push—or a gentle shove—or anything in between—think of Schrader Air Cylinders.

The possible uses of Schrader Air Cylinders in industrial plants are so numerous that it is impossible to do more than suggest their great utility and versatility. We'll be glad to give you specific recommendations, however, if you'll just write, outlining the processes used in your plant—or fill out the coupon below.

Schrader
REG. U. S. PAT. OFF.

products
control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Mail This Coupon Today

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
478 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. W-3

I am interested in more information on.....

Name_____ Title_____

Company_____

Address_____

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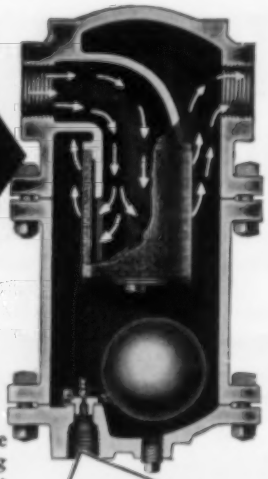
NO MOISTURE OR DIRT GETS BY HERE



Johnson Self-Draining Compressed Air Separator.....

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. Controlled expansion of air in separator precipitates most of the moisture.
2. A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.

Johnson Separation Devices include Separators for Compressed Air or Steam, After coolers, oil absorbers.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

WRITE FOR CATALOG

The Johnson Corporation

830 WOOD STREET THREE RIVERS, MICH.

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LOGAN AIR AND HYDRAULIC POWER

SPEEDS • COORDINATES • REFINES PRODUCTION

IN OVER 10,000 INDUSTRIAL PLANTS

Logan

AIR CONTROL VALVES

• BALANCED PISTON
• COMPACT DESIGN
• EASILY INSTALLED
• SELF-CLEANING

79 MODELS

MOSTLY STOCK DELIVERY

• AIR CONTROL VALVES • AIR CYLINDERS • AIR-DRAULIC CYLINDERS • AIR and HYDRAULIC PRESSES • COLLET GRIP TUBE FITTINGS • AIR CHUCKS • HYDRAULIC CONTROL VALVES • HYDRAULIC CYLINDERS • HYDRAULIC POWER UNITS • SURE-FLOW COOLANT PUMPS •

SAVES TIME Logan AIR AND HYDRAULIC EQUIPMENT SHORT-MOTION

LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS • CATALOG ON REQUEST

Consult Logan for your Special Heavy-Duty, Mill-Type Cylinder requirements.

LOGANSPORT MACHINE CO., INC.

846 Center Avenue Logansport, Indiana

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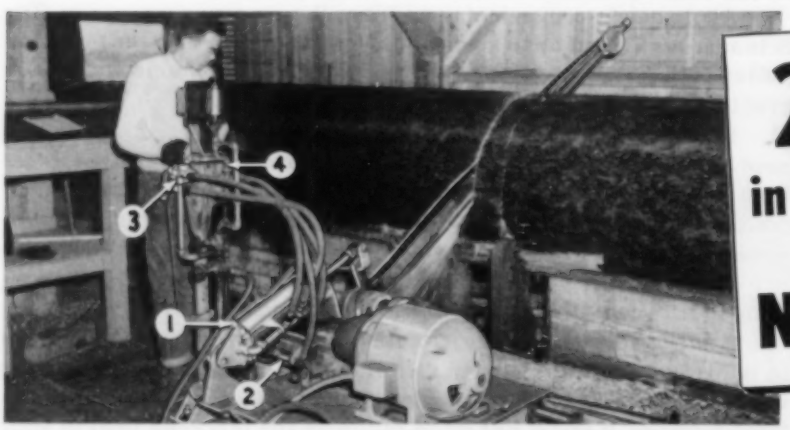

2 Vital Movements in Deck Saw Operation Powered by NOPAK Cylinders

This carriage-type deck saw, designed and built by Elk Lumber Co. Medford, Ore., eliminates mis-cutting, and short logs reaching the carriage.

The 8 foot chain-saw bar is raised and lowered by a NOPAK Model E, 6" x 14" Air Cylinder. Horizontal carriage movement of 10", powered by a NOPAK 4"x10" Air Cylinder, permits operator to locate saw accurately to cut logs within minimum tolerance of ½". Both movements are controlled by NOPAK valves mounted at operator's station.

This is typical of hundreds of machine movements in which NOPAK Cylinders and Valves are used in all types of industry. For others, see the NOPAK Application Manual.

Arrow No. 1 — NOPAK 6"x14" Model E Cylinder
Arrow No. 2 — NOPAK 4"x10" Model E Cylinder
Arrow No. 3 and No. 4—NOPAK ½" 4-Way Valve

•

Refer to Sweet's File for Product Designers or write for Bulletin SW-2.

GALLAND-HENNING NOPAK DIVISION

2759 S. 31st STREET • MILWAUKEE 46, WISCONSIN

NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

Representatives in Principal Cities

A 7702-½-H

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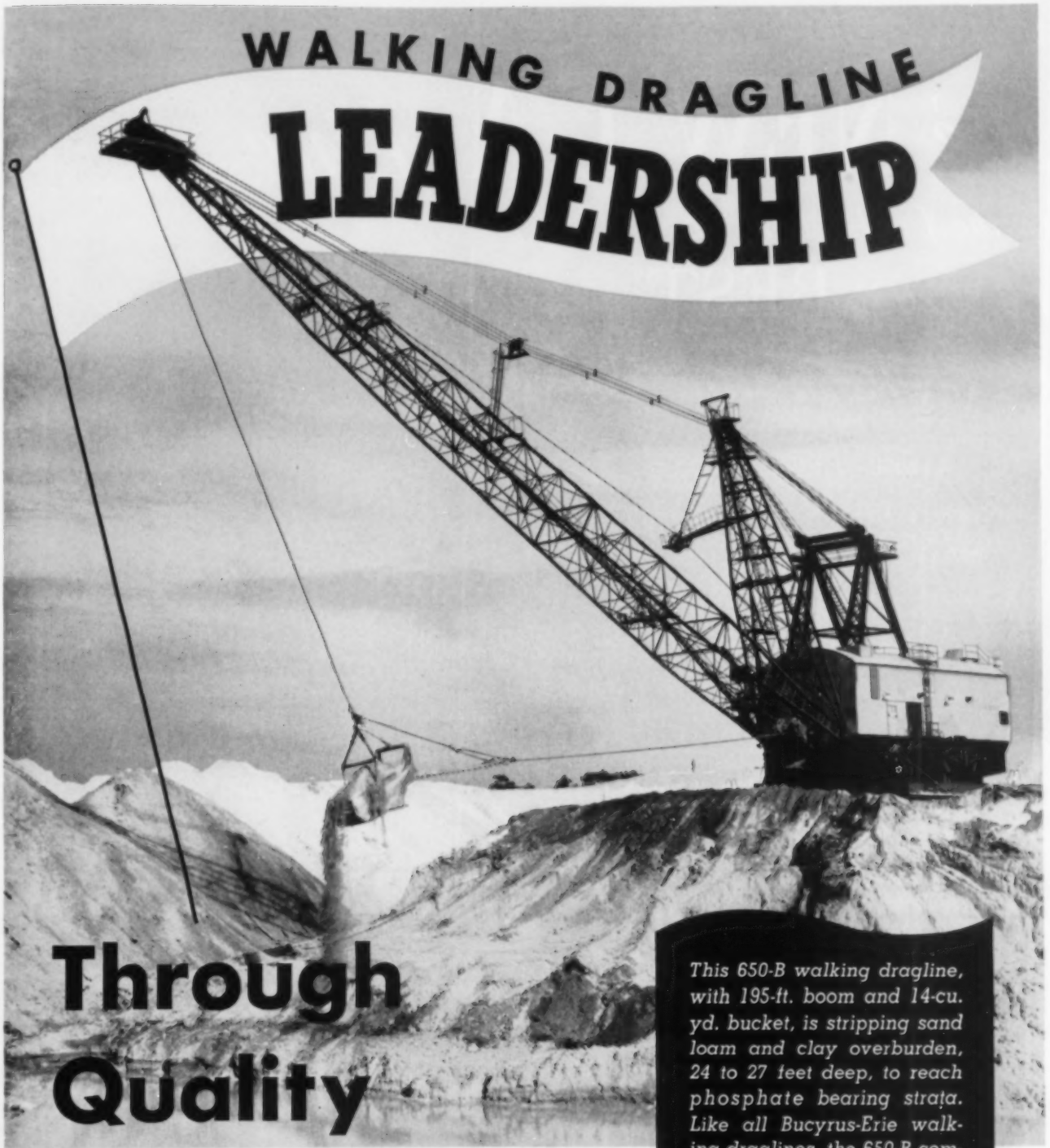


Through Quality Performance

This 650-B walking dragline, with 195-ft. boom and 14-cu. yd. bucket, is stripping sand loam and clay overburden, 24 to 27 feet deep, to reach phosphate bearing strata. Like all Bucyrus-Erie walking draglines, the 650-B combines large bucket capacity and digging reach with economical performance for low cost removal of overburden.

Judge a Bucyrus-Erie walking dragline by any standard of quality — design, construction, performance, durability — and you'll find that it comes out on top. That's why you can choose a Bucyrus-Erie walker with confidence, and depend on it to deliver many years of big-yardage, low-cost performance on the toughest jobs. Offered in sizes from 4- to 30-cu. yds., Bucyrus-Erie walking draglines are ready to help solve your overburden stripping problems, efficiently and economically.

17L53C

BUCYRUS ERIE

South Milwaukee, Wisconsin

Circle 40A on reply card

Here's why

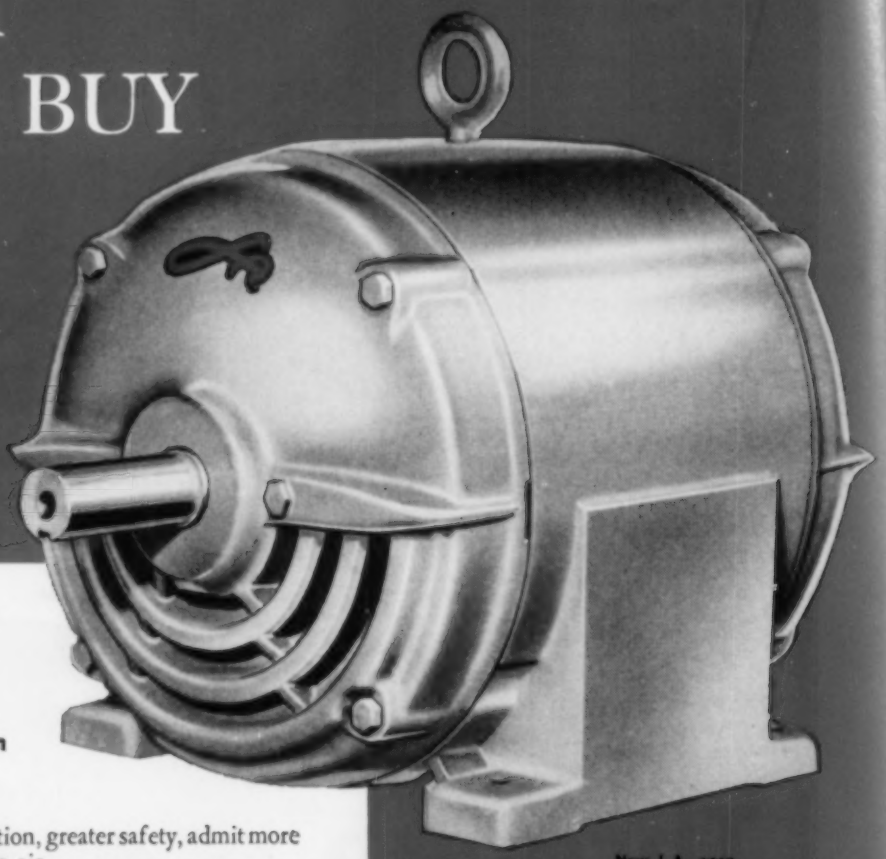
the NEW L.A. *Line*

by the Louis Allis Co.

is your BEST *electric motor* BUY

A smaller, better power package to meet new NEMA standards

with NEW MODERN STYLING



New L.A. open, drip-proof motor

plus

Improved ventilation
New conduit-box arrangement
New bearing construction
More compact design and better protection
More versatile mounting

Here you have complete use of modern motor materials, design techniques and new manufacturing methods. You also get more power in a smaller package — and clean, streamlined motor styling to add modern appearance to the equipment these new motors drive.

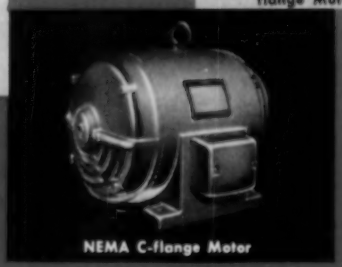
This new styling is completely functional. Ventilating grilles, for example, blend into the general motor design — yet they provide better protection, greater safety, admit more cooling air.

Completely enclosed housing provides protection for the new L.A. line in any mounting position — floor, sidewall, or ceiling.

Standardize now on the new L.A. line for both your product and your plant — and get the most modern motor construction available. See your nearby Louis Allis Sales Engineer today for the complete story.

Vertical NEMA C-flange Motor

NEMA D-flange Motor



NEMA C-flange Motor

THE LOUIS ALLIS CO.

Milwaukee 7, Wisconsin

LA-102

We specialize in SPECIAL MOTORS — *and* PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

NOW TOOL UP FOR MULTIPLE SAVINGS

through . . .

AIR engineering

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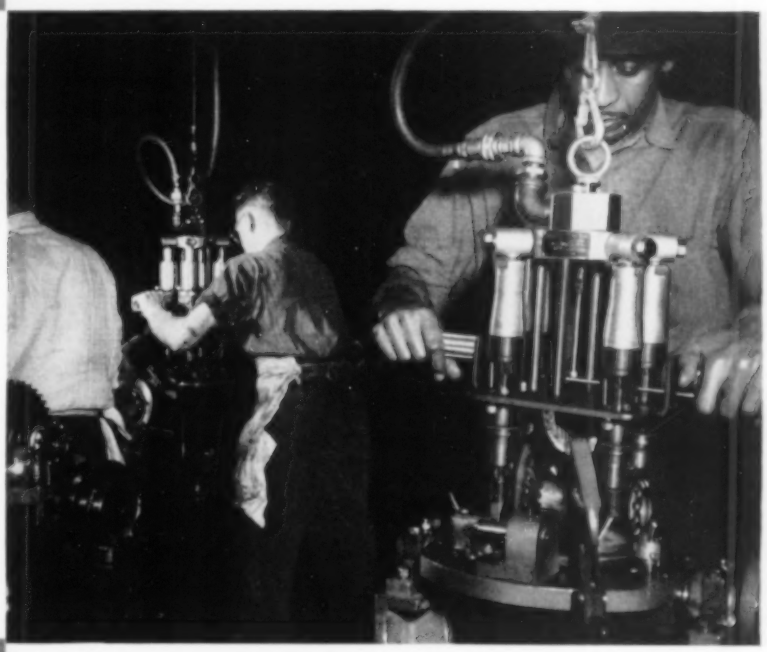
MULTIPLE NUT-RUNNERS

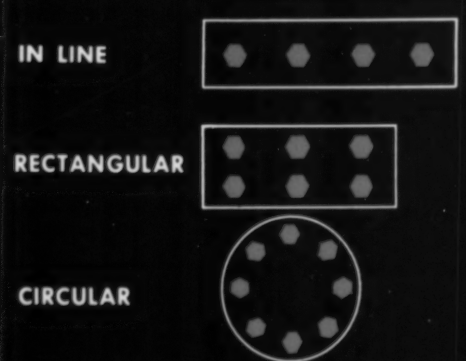


new idea!

Note in this plant, the Model YD4A Nut Runner in the foreground is tightening differential bearing caps for the machining operations. In the background, a Model YG4A is *removing* the cap screws prior to final assembly. Each is handling 4 operations at once—substantial saving against single power tool or one-at-a-time operation by hand!

built to your specifications

in typical bolt patterns like these:



Other bolt patterns built to your needs in a wide range of capacities and torque requirements.

2 to 10 nuts--or more . . . are driven simultaneously!

I-R Multiple Nut Runners give you:

- Top "quality control"—Torque is uniform on each and every nut.
- Safe for operator—Torque resistance doesn't exist.
- Instant on-the-job operation—no special training is required by the operator.
- Low maintenance—units in service show maintenance savings up to 50%.

Talk to the I-R representative in your area and get full details on cost-saving Multiple Nut Runners for your specific applications. Meantime, write for latest bulletin which shows how they are built to your specifications.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

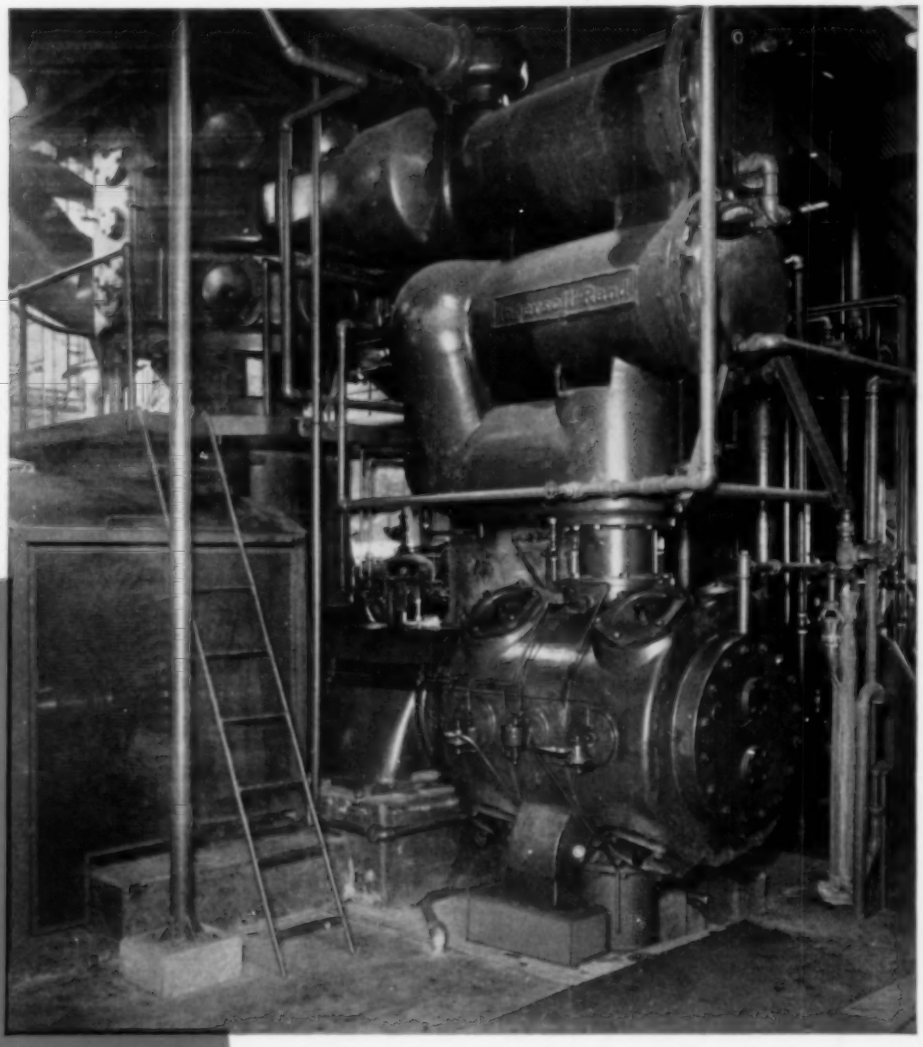
AIR engineering

the modern way to faster production

8-25

Circle 41A on reply card

Circle 42A on reply card



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